AD-A205 411

INSTALLATION RESTORATION PROGRAM
PHASE II–CONFIRMATION/QUANTIFICATION
STAGE 1

For

Minot Air Force Base
Minot, North Dakota

Prepared By:

FRED C. HART ASSOCIATES, INC.
530 Fifth Avenue
New York, NY 10036

October 1988

Volume 3 of 3

Appendices G Through M

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

Prepared For:

HEADQUARTERS STRATEGIC AIR COMMAND
COMMAND SURGEONS OFFICE (HQ SAC/SGPB)
BIOENVIRONMENTAL ENGINEERING DIVISION
OFFUTT AIR FORCE BASE, NEBRASKA 68113
And
UNITED STATES AIR FORCE OCCUPATIONAL &
ENVIRONMENTAL HEALTH LABORATORY (USAFOEHL)
TECHNICAL SERVICES DIVISION (TS)
BROOKS AIR FORCE BASE, TEXAS 78235-5501

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INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION QUANTIFICATION

STAGE 1

APPENDICES TO THE FINAL REPORT
FOR

MINOT AIR FORCE BASE
MINOT, NORTH DAKOTA

HEADQUARTERS STRATEGIC AIR COMMAND
COMMAND SURGEON'S OFFICE (HQ SAC/SGPB)
BIOENVIRONMENTAL ENGINEERING DIVISION
OFFUTT AIR FORCE BASE, NEBRASKA 68113

October 1988

Prepared by:

Fred C. Hart Associates, Inc.
530 Fifth Avenue
New York, NY 10036

USAF CONTRACT No. F33615-84-D-4404
Delivery Order No. 0008

USAF Technical Program Manager:
1Lt Franz J. Schmidt

Prepared For:

United States Air Force Occupational
and Environmental Health Laboratory (USAFOEHL)
Technical Services Division (TS)
Brooks Air Force Base, Texas 78235-5501

(CL5060B/0528N)

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Distribution/
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A-1

LIST OF APPENDICES

(CL5061B/0536N)

LIST OF APPENDICES (Continued)

(CL506iB/0536N)

LIST OF APPENDICES (Continued)

(CL5061B/0536N)

APPENDIX G

CHAIN OF CUSTODY FORMS

P. 1 of 2

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : ML 10/12
Date Rec'd: _____

Client Name: USAF
Client No: 01071-00-36002.01

Sampled by: V. De Vilbiss
Sample Group ID or site name: MAFB-MINOT, ND
ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp. (°C)	Flow (gpm)	Notes	ML No.
MAFB, SW1, GW-1, HART 001	10 30 86 / 10:30A	6.65	1.71	8			
MAFB, DW1, GW-1, HART 003	" / 11:00A	6.90	2.18	"			
MAFB, SW6, GW-1, HART 007	" / 11:30A	7.15	4.57	"			
MAFB, DW3, GW-1, HART 013	" / 11:45A	11.35	3.07	"			
MAFB, DW4, GW-1, HART 014	" / 1:00P	6.35	4.67	"			
MAFB, SW8, GW-1, HART 008	" / 1:25P	8.35	2.64	"			

COPY

G.1

Analysis Requested:

____ pH, Alkalinity, Conductivity	____ Sus. Solids	____ Oil & Grease	____ Iron (Fe)
____ Acidity (Mineral or Total)	____ Dis. Solids	____ Dis. O_2	____ Manganese (Mn)
____ NH_3, NO_3, NO_2, TKN, Org. N	____ Total Solids	____ Coli - Fecal	
____ CN, CN-free, F	____ Turbidity	____ Coli - Total	
____ SO_4	____ PO_4	____ BOD_5, COD, TOC	
____ As, Ba, Cd, Cr, Pb, Hg, Se, Ag	____ Al, Co, Cu, Mo, Ni	____ Zinc	
____ Sb, Be, Sr, Ti, Tl, V	____ Ca, Mg, Na, K	____ Chromium (Hex.)	
X Volatile ORGANICS, TPHC's, BN/AE, PP Metals (13), TDS, Common Anions			

Shipment Method & Carrier (if applicable): FED EX Cooler w/ice
Date sent: 10-30-86

Requested by: Vanessa Middleton
Received by: _____
Date/Time: 10/31/86 10:00

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

CHAIN OF CUSTODY RECORD

PROJECT # 86GW3506 | PROJECT NAME: Fred C. Hart

SAMPLERS SIGNATURE

STAT. #	DATE	TIME	STATION LOCATION	SOLIDS T.O	TPHCS	Comanche	[illegible]	METALS 8	CYANIDES	ASBESTOS	ANALYSIS REQUIRED: ORGANICS GC/MS	BASE/ NEUTRAL	VOLATILE ORGANICS	PESTICIDES & PCB's	BALANCE- ULCOR	MISC. CHEM.	REMARKS
	10/25	3:00	004	✓	✓	✓		✓				✓	✓				1 VO, 1 Plastic 3 Glass
	10/29	2:00	005	✓	✓	✓		✓				✓	✓				4 Glass / 2 VO's
	10/29	1:05	006	✓	✓	✓		✓				✓	✓				2 Plastic / 2 Glass 2 VO's
	10/29	12:00	009		✓		✓						✓				1 Plastic / 1 Glass 2 VO's
	↓	12:00	010		✓		✓						✓				1 1
	↓		011 Field Blank		✓		✓						✓				1 Plastic / 1 Glass 1 VO
	↓		012		✓	✓		✓				✓	✓				2 Glass / 2 Plastic 4 VO's
	↓		015 Field Blank	✓	✓	✓		✓				✓	✓				2 Glass / 2 Plastic 1 VO
	↓		Trip Blank										✓				1 VO

SAMPLES RECEIVED: 9 HOW MANY CONTAINERS? 9/2

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Rec'd by: (signature)
Fed Ex.	10/30/86 11:30			10/31/86 300	Robert Renn
Relinquished by:	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Rec'd by: (signature)
[illegible] linquished by: [illegible]ature)	Date/Time	Rec'd for laboratory by (signature):	Date/Time	REMARKS:	

[illegible] LABORATORY, PO BOX 3108, PRINCETON, NJ 08540

G.2

§6043528 Fred C. Hart

PROJECT # | PROJECT NAME:

SAMPLERS SIGNATURE

LAT. #	DATE	TIME	STATION LOCATION	SOLIDS	TPHCs	Common Anions TDS	MERCURY	METALS #2	CYANIDES	ASBESTOS	ANALYSIS REQUIRED: ORGANICS GC/MS	BASE/NEUTRAL	VOLATILE ORGANICS	PESTICIDES & PCB's	HERBICIDES	MISC. CHEM.	REMARKS
	10/30		001		✓	✓		✓				✓	✓				
			003		✓	✓		✓				✓	✓				
			007		✓	✓		✓				✓	✓				
			008		✓	✓		✓				✓	✓				
			013		✓	✓		✓				✓	✓				
			014		✓	✓		✓				✓	✓				
			017		✓	✓		✓				✓	✓				
			018		✓	✓		✓					✓				
			019		✓	✓		✓				✓	✓				

COPY

G.3

ARE 5 RECEIVED: 12 HOW MANY CONTAINERS? 72

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Rec'd by: (signature)
Federal Express	10/31/16 12:0			10/31/16	
Relinquished by:	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Rec'd by: (signature)
Relinquished by: (signature)	Date/Time	Rec'd for laboratory by (signature):	Date/Time	REMARKS:	

[redacted] LABORATORY, PO BOX 3108, PRINCETON, NJ 08540

PAGE 1

CHAIN OF CUSTODY RECORD

660332 Fred C. Hunt
OJECT # PROJECT NAME:

MPLERS SIGNATURE

ANALYSIS REQUIRED

AT.#	DATE	TIME	STATION LOCATION	SOILS	TPHCs	Comm'l Analysis TDS	MERCURY WP	METALS	CYANIDES	ASBESTOS	ORGANICS GC/MS	BASE/ NEUTRAL	VOLATILE ORGANICS	PESTICIDES & PCB's	SILVER-CLOUDY	MISC. CHEM.	REMARKS
	10/30		020		✓	✓	✓					✓	✓				
			021		✓	✓	✓					✓	✓				
			022		✓	✓	✓						✓				
			Trip Blank										✓				

COPY

G.4

AIR BILLS RECEIVED: 12 HOW MANY CONTAINERS? 72

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Rec'd by: (signature)
Federal Express	10/31/88 11:00			10/31/88	
Relinquished by:	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Rec'd by: (signature)
Relinquished by: (signature)	Date/Time	Rec'd for laboratory by (signature):	Date/Time	REMARKS:	

LABORATORY, PO BOX 3108, PRINCETON,NJ 08540

PAGE

P.2 of 2

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : ML 12

Date Rec'd: _____

Client Name: USAF

Client No: 9071-00-86008-00

Sampled by: V. DeVilbiss

Sample Group ID or site name: MAFB-MINOT, ND

ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes	ML No.
MAFB, FTA, FIELD BLANK, HART 011	10.29.86					2 JARS; 2 VOA'S TPHC's, Volatile ORGS, Pb	
MAFB SLF, FIELD BLANK, HART 015	"					4 JARS; 2 VOAS; Vol. ORGS, TPHC's, 13 P.P. METALS, BN/AE, TDS, COMMON ANIONS	
TRIPBLANK	"					1 VOA - Vol. ORGS.	

G.5

Analysis Requested:

____ pH, Alkalinity, Conductivity	____ Sus. Solids	____ Oil & Grease	____ Iron (Fe)
____ Acidity (Mineral or Total)	____ Dis. Solids	____ Dis. O_2	____ Manganese (Mn)
____ NH_3, NO_3, NO_2, TKN, Org. N	____ Total Solids	____ Coli - Fecal	_____
____ CN, CN-free, F	____ Turbidity	____ Coli - Total	_____
____ SO_4	____ PO_4	____ BOD_5, COD, TOC	_____
____ As, Ba, Cd, Cr, Pb, Hg, Se, Ag	____ Al, Co, Cu, Mo, Ni	____ Zinc	_____
____ Sb, Be, Sr, Ti, Tl, V	____ Ca, Mg, Na, K	____ Chromium (Hex.)	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shipment Method & Carrier (if applicable): Fed Ex Cooler w/ice Date sent: 10.29.86

Requested by: Vincent J. DeVilbiss Received by: Bet Date/Time: 10/30/86

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

P2 of 2

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : HL 12

Date Rec'd:

Client Name: USAF

Client No: 01071-00
86008-00

Sampled by: V. DeVilliez

Sample Group ID or site name: MAFB-Minot, ND

ID or Permit No.:

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp. (°C)	Flow (gpm)	Notes	HL No.
MAFB, DW5, GW-1, HART 021	10.30.86/1:15p	6.65	4.67	8			
MAFB, MW1, GW-1, HART 017	" /2:00p	11.4	1.76	"			
MAFB, MW2, GW-1, HART 018	" /2:25p	14+	3.47	"			
MAFB, MW3, GW-1, HART 019	" /3:55p	10.40	2.00	"			
MAFB, MW4, GW-1, HART 020	" /4:30p	9.60	2.24	"			
TRIP BLANK	" /					Vol. ORGANICS, TPHC's, 13 P.P. Metals, TDS, Common Anions.	

Analysis Requested:

→ Volatiles only

G.6

- ____ pH, Alkalinity, Conductivity
- ____ Acidity (Mineral or Total)
- ____ NH_3, NO_3, NO_2, TKN, Org. N
- ____ CN, CN-free, F
- ____ SO_4
- ____ As, Ba, Cd, Cr, Pb, Hg, Se, Ag
- ____ Sb, Be, Sr, Ti, Ta, V
- X See page 1 for DW5 through MW4
- ____ Sus. Solids
- ____ Dis. Solids
- ____ Total Solids
- ____ Turbidity
- ____ PO_4
- ____ Al, Co, Cu, Mo, Ni
- ____ Ca, Mg, Na, K
- ____ Oil & Grease
- ____ Dis. O_2
- ____ Coli - Fecal
- ____ Coli - Total
- ____ BOD_5, COD, TOC
- ____ Zinc
- ____ Chromium (Hex.)
- ____ Iron (Fe)
- ____ Manganese (Mn)

Shipment Method & Carrier (if applicable): FEDEX Cooler w/ice

Date sent: 10.30.86

Requested by:

Received by:

Date/Time: 12/31/86 10:00

Final Disposition of Sample(s)

Date:

By (Init.):

P. 1 of 2

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : HL 12

Date Rec'd: _____

Client Name: USAF

Client No: 61071-00-86008-00

Sampled by: V. DeVillez

Sample Group ID or site name: MAFB - MINOT, ND

ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes	HL No.
MAFB, SW-9, GW-1, HART 009	10.29.86/12:00p	13.80	17.62	8(C)		2 JARS; 2 VOA'S Volatile ORGANICS, TPHC'S, Pb	
MAFB, SW-9, GW-2, HART 010	"	—	—	—		" "	
MAFB, SW-5, GW-1, HART 006	" 11:05p	9.95	7.48	8°		4 JARS; 2 VOA'S Vol. ORGS, TPHC'S, 13 P.P. METALS,	
MAFB, SW-4, GW-1, HART 005	" 12:00p	11.60	5.33	8°		EXTRACTABLE P.P., TDS, Cation Anion	
MAFB, OW-2, GW-1, HART 012	" 13:30p	12.75	2.86	8°		" "	
MAFB, SW-3, GW-1, HART 004	" 13:00p	13.35	5.84	8°		" "	

Analysis Requested:

____ pH, Alkalinity, Conductivity	____ Sus. Solids	____ Oil & Grease	____ Iron (Fe)
____ Acidity (Mineral or Total)	____ Dis. Solids	____ Dis. O_2	____ Manganese (Mn)
____ NH_3, NO_3, NO_2, TKN, Org. N	____ Total Solids	____ Coli - Fecal	_____
____ CN, CN-free, F	____ Turbidity	____ Coli - Total	_____
____ SO_4	____ PO_4	____ BOD_5, COD, TOC	_____
____ As, Ba, Cd, Cr, Pb, Hg, Se, Ag	____ Al, Co, Cu, Mo, Ni	____ Zinc	_____
____ Sb, Be, Sr, Ti, Tl, V	____ Ca, Mg, Na, K	____ Chromium (Hex.)	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shipment Method & Carrier (if applicable): FED EX Cooler w/ice

Date sent: 10.29.86

Requested by: Theresa J. DeVillez

Received by: [signature]

Date/Time: 10/30/86

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

G.7

CHAIN OF CUSTODY RECORD

866W3538 Frank C. Hart
PROJECT # PROJECT NAME:

SAMPLERS SIGNATURE

STAT. #	DATE	TIME	STATION LOCATION	SOLIDS			MERCURY	METALS	CYANIDES	ASBESTOS	ANALYSIS REQUIRED: ORGANICS GC/MS	BASE/ NEUTRAL	VOLATILE ORGANICS	PESTICIDES & PCB's	BACTERIOLOGY	MISC. CHEM.	REMARKS
	11/3		Hart 023														
	11/3		024														
	11/3		025														
	11/3		026														
	11/3		027														

6.8

SAMPLES RECEIVED: 5 HOW MANY CONTAINERS? 30

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Rec'd by: (signature)
Vanessa	11/3/86 11:00			11/3/86 6:30	Robert Kern
Relinquished by:	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Rec'd by: (signature)
Relinquished by: (signature)	Date/Time	Rec'd for laboratory by (signature):	Date/Time	REMARKS:	

..., PO BOX 3108, PRINCETON, NJ 08540

P. 1 of 1

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : HL 12

Date Rec'd: _____

Client Name: USAF

Client No: C1071-008200803

Sampled by: V. DeWilke (HART)

Sample Group ID or site name: MAFB - MINOT, ND

ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes
MAFB, SWA, SI, HART 023	11.3.86					4 JARS; 2 VA's
MAFB, SWB, SI, HART 024	11.3.86					" "
MAFB, SWC, SI, HART 025	11.3.86					
MAFB, SWD, SI, HART 026	11.3.86					
MAFB, SWE, SI, HART 027	11.3.86					

Analysis Requested:

____ pH, Alkalinity, Conductivity	____ Sus. Solids	____ Oil & Grease	____ Iron (Fe)
____ Acidity (Mineral or Total)	____ Dis. Solids	____ Dis. O_2	____ Manganese (Mn)
____ NH_3, NO_3, NO_2, TKN, Org. N	____ Total Solids	____ Coli - Fecal	____
____ CN, CN-free, F	____ Turbidity	____ Coli - Total	____
____ SO_4	____ PO_4	____ BOD_5, COD, TOC	____
____ As, Ba, Cd, Cr, Pb, Hg, Se, Ag	____ Al, Co, Cu, Mo, Ni	____ Zinc	____
____ Sb, Be, Sr, Ti, Tl, V	____ Ca, Mg, Na, K	____ Chromium (Hex.)	____
X Petroleum Hydrocarbons			
X 13 Priority Pollutant METALS, Volatile organics, TOX, Common Anions, RNKE			

Shipment Method & Carrier (if applicable): Hand delivered to PTL Date sent: 11.3.86

Requested by: Vincent DeWilke Received by: _____ Date/Time: _____

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

G.9

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : HL 12

Date Rec'd: _____

Client Name: USAF

Client No: 0107-00-86008-00

Sampled by: V. DeVilliez (HART)

Sample Group ID or site name: MAFB - MINOT, ND

ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes	HL No
MAFB, TB-1, SS-2, 5'-7', HART 001	10-22-86					SPLIT SPOON SOIL SAMPLE - 1 8-OZ JAR; 1 VOA VIAL	
MAFB, TB-1, SS-3, 10'-12', HART 002	10-22-86					" "	
MAFB, TB-1, SS-4, 15'-17', HART 003	10-22-86					" " (SPLIT W/ USAFOEHL)	
MAFB, TB-1, SS-5, 20'-22', HART 004	10-22-86					" "	
MAFB, SD-1, S-2, 0.5'-1.0', HART 005	10-23-86					HAND AUGER SEDIMENT SAMPLE - 1 8-OZ JAR	
MAFB, SD-2, S-1, 0-0.5', HART 006	10-23-86					" "	

G.10

Analysis Requested:

____	pH, Alkalinity, Conductivity	____	Sus. Solids	____	Oil & Grease	____	Iron (Fe)
____	Acidity (Mineral or Total)	____	Dis. Solids	____	Dis. O_2	____	Manganese (Mn)
____	NH_3, NO_3, NO_2, TKN, Org. N	____	Total Solids	____	Coli - Fecal	____	
____	CN, CN-free, F	____	Turbidity	____	Coli - Total	____	
____	SO_4	____	PO_4	____	BOD_5, COD, TOC	____	
X	As, Ba, Cd, Cr, (Pb) Hg, Se, Ag	____	Al, Co, Cu, Mo, Ni	____	Zinc	____	
____	Sb, Be, Sr, Ti, Ta, V	____	Ca, Mg, Na, K	____	Chromium (Hex.)	____	
X	Petroleum HYDROCARBONS						
X	Aromatic & Halogenated Volatile ORGANICS						

Shipment Method & Carrier (if applicable): Cooler w/ blue ice - FEDERAL EXPRESS Date sent: 10-24-86

Requested by: Vanessa J. DeVilliez Received by: _____ Date/Time: _____

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

P. 1 of 1

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : HL 12

Date Rec'd: _____

Client Name: USAF

Client No: 01071-008008-00

Sampled by: V. DeVilker (HART)

Sample Group ID or site name: MAFB - MINOT, ND

ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes	HL No.
MAFB, TB-2, SS-2, 5-7' HART 009	10.24.86					SPLIT SPOON SOIL SAMPLE - 1 8oz JAR; 1 VOA VIAL	
MAFB, TB-2, SS-5, 18-20' HART 010	"					" "	

G.11

Analysis Requested:

____ pH, Alkalinity, Conductivity	____ Sus. Solids	____ Oil & Grease	____ Iron (Fe)
____ Acidity (Mineral or Total)	____ Dis. Solids	____ Dis. O_2	____ Manganese (Mn)
____ NH_3, NO_3, NO_2, TKN, Org. N	____ Total Solids	____ Coli - Fecal	_____
____ CN, CN-free, F	____ Turbidity	____ Coli - Total	_____
____ SO_4	____ PO_4	____ BOD_5, COD, TOC	_____
____ As, Ba, Cd, Cr, Pb, Hg, Se, Ag	____ Al, Co, Cu, Mo, Ni	____ Zinc	_____
____ Sb, Be, Sr, Ti, Tl, V	____ Ca, Mg, Na, K	____ Chromium (Hex.)	_____
X Petroleum Hydrocarbons	_____	_____	_____
X 13 Priority Pollutant METALS	_____	_____	_____

Shipment Method & Carrier (if applicable): Cooler w/Blue ice - FED. EXPRESS Date sent: 10.24.86

Requested by: Vanessa DeVilker Received by: _____ Date/Time: _____

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

P. 2 of 2

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : HL 12
Date Rec'd: _____

Client Name: USAF

Client No: 01071-00-86008-00

Sampled by: V. DeVillez (HART)

Sample Group ID or site name: MAFB - MINOT, ND

ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes	HL No.
MAFB, SD-3, S-1, 0-0.5', HART 007	10.23-86					HAND AUGER SEDIMENT SAMPLE - 1 8-OZ JAR, 1 VOA Vial	
MAFB, SD-4, S-1, 0.5'-1.0', HART 008	10.23.86					" "	
TRIP Blank	10.24.86					DISTILLED WATER - Analyze Volatiles Only - 1 VOA Vial	

G.12

Analysis Requested:

____	pH, Alkalinity, Conductivity	____	Sus. Solids	____	Oil & Grease	____	Iron (Fe)
____	Acidity (Mineral or Total)	____	Dis. Solids	____	Dis. O_2	____	Manganese (Mn)
____	NH_3, NO_3, NO_2, TKN, Org. N	____	Total Solids	____	Coli - Fecal		
____	CN, CN-free, F	____	Turbidity	____	Coli - Total		
____	SO_4	____	PO_4	____	BOD_5, COD, TOC		
X	As, Ba, Cd, Cr, (Pb), Hg, Se, Ag	____	Al, Co, Cu, Mo, Ni	____	Zinc		
____	Sb, Be, Sr, Ti, Tl, V	____	Ca, Mg, Na, K	____	Chromium (Hex.)		
X	Petroleum Hydrocarbons						
X	Aromatic & Halogenated Volatile ORGANICS						

Shipment Method & Carrier (if applicable): Cooler w/blue ice - FEDERAL EXPRESS Date sent: 10.24.86

Requested by: Vanessa J. DeVillez Received by: _____ Date/Time: _____

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

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P. 2 of 2

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : HL12
Date Rec'd: _____

Client Name: USAF

Client No: 0071-00-85008.1

Sampled by: V. DeVilbiss, J. Volz, B. Mackie

Sample Group ID or site name: MAFB-MINOT, ND

ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes
MAFB, SW-8, SS-6, 13'-15', HART 007	10.23.86					2 Bottles
MAFB, SW-9, SS-6, 15'-17', HART 008	10.23.86					2 Bottles
MAFB, DW-1, ST-1, 46-48', HART 009	10.10.86					1 TUBE
MAFB, DW-2, ST-1, 14'-16', HART 010	10.15.86					1 TUBE
MAFB, DW-4, ST-1, 20'-22', HART 011	10.21.86					1 TUBE
MAFB, SW-8, ST-1, 15'-17', HART 012	10.23.86					1 TUBE

Analysis Requested: * MAFB, SW-9, ST-1, 15'-17', HART 013 10/23/86 1 TUBE

____	pH, Alkalinity, Conductivity	____	Sus. Solids	____	Oil & Grease	____	Iron (Fe)
____	Acidity (Mineral or Total)	____	Dis. Solids	____	Dis. O_2	____	Manganese
____	NH_3, NO_3, NO_2, TKN, Org. N	____	Total Solids	____	Coli - Fecal	____	
____	CN, CN-free, F	____	Turbidity	____	Coli - Total	____	
____	SO_4	____	PO_4	____	BOD_5, COD, TOC	____	
____	As, Ba, Cd, Cr, Pb, Hg, Se, Ag	____	Al, Co, Cu, Mo, Ni	____	Zinc	____	
____	Sb, Be, Sr, Ti, Tl, V	____	Ca, Mg, Na, K	____	Chromium (Hex.)	____	
X	Sieve & Hydrometer (JARS)						
X	PERMEABILITY (TUBES)						

Shipment Method & Carrier (if applicable): FEDEX

Date sent: 10.28.86

Requested by: Vincent DeVilbiss

Received by: [signature]

Date/Time: 10-30-

Final Disposition of Sample(s) [signature]

Date: 11/3/86

By (Init.): _____

Dispose 1 JAN 87

G.13

P. 1 of 2

01071-00-86008-00

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY 86/125-SC 01A
Abbreviated Form

FORM : ML 8/12

Date Rec'd: _____

Client Name: USAF

Client No: 01071-00-86008

Sampled by: U.DeVillez, J. Volz, B. Mackie

Sample Group ID or site name: MAFB - MINOT, ND

ID or Permit No.: _____

	Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes
✓	MAFB, SW-1, SS-9, 40'-42', HART 001	10.11.86					2 Bottles
✓	MAFB, SW-3, SS-4, 15'-17', HART 002	10.9.86					2 Bottles
✓	MAFB, OW-1, SS-10, 45-47', HART 003	10.7.86					1 Bottle
✓	MAFB, OW-4, SS-11, 38'-40', HART 004	10.17.86					2 Bottles
✓	MAFB, DW-2, SS-6, 10'-12', HART 005	10.15.86					1 Bottle
✓	MAFB, SW-5, SS-6, 10'-12', HART 006	10.17.86					1 Bottle

Analysis Requested:

____	pH, Alkalinity, Conductivity	____	Sus. Solids	____	Oil & Grease	____	Iron (Fe)
____	Acidity (Mineral or Total)	____	Dis. Solids	____	Dis. O_2	____	Manganese
____	NH_3, NO_3, NO_2, TKN, Org. N	____	Total Solids	____	Coli - Fecal	____	
____	CN, CN-free, F	____	Turbidity	____	Coli - Total	____	
____	SO_4	____	PO_4	____	BOD_5, COD, TOC	____	
____	As, Ba, Cd, Cr, Pb, Hg, Se, Ag	____	Al, Co, Cu, Mo, Ni	____	Zinc	____	
____	Sb, Be, Sr, Ti, Tl, V	____	Ca, Mg, Na, K	____	Chromium (Hex.)	____	
X	Sieve & Hydrometer						

Shipment Method & Carrier (if applicable): FEDEX

Date sent: 10-28-86

Requested by: Vanessa J. DeVillez

Received by: [signature]

Date/Time: 10-30-

Final Disposition of Sample(s) [signature]

Date: 10/30/86

By (Init.): _____

Dispose 1 Jan 87

G.14

APPENDIX H

LABORATORY ANALYTICAL RESULTS REPORTS

(CL5060B/0528N)

APPENDIX H.1

AROMATIC AND HALOGENATED VOLATILE ORGANIC ANALYSES RESULTS FOR WATER SAMPLES

(CL5060B/0528N)

APPENDIX H.1.a

AROMATIC AND HALOGENATED VOLATILE
ORGANIC ANALYSES RESULTS FOR PTL
JOB NO. 86GW3506 WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
609-452-9050
TLX 84-3492

princeton testing laboratory

Member

METHOD DETECTION LIMIT
601/602

	(WATER)		(SOIL)	
Chloromethane	20	Micrograms/liter	800	Micrograms/kg
Bromomethane	10		400	
Dichlorodifluoromethane	5		200	
Vinyl Chloride	2		80	
Chloroethane	2		80	
Methylene Chloride	5		200	
Trichlorofluoromethane	5		200	
1,1-dichloroethene	1		40	
1,1-dichloroethane	1		40	
trans-1,2-dichloroethene	1		40	
Chloroform	2		80	
1,2-dichloroethane	1		40	
1,1,1-trichloroethane	2		80	
Carbon Tetrachloride	2		80	
Bromodichloromethane	2		80	
1,2-dichloropropane	1		40	
trans-1,3-dichloropropene	5		200	
Trichloroethene	2		80	
Dibromochloromethane	2		80	
1,1,2-trichloroethane	5		200	
cis-1,3-dichloropropene	5		200	
2-chloroethylvinylether	5		200	
Bromoform	10		400	
1,1,2,2-tetrachloroethane	10		400	
Tetrachloroethene	2		80	
Benzene	1		40	
Toluene	1		40	
Chlorobenzene	1		40	
Ethylbenzene	1		40	
1,3-dichlorobenzene	1		40	
1,2-dichlorobenzene	1		40	
1,4-dichlorobenzene	1		40	

Princeton Service Center
U.S. Route 1
609-452-9050
TLX 84-3492

princeton testing laboratory

Member

December 2, 1986

FRED C. HART ASSOCIATES

JOB #86GW3506

(See attached sheet for MDL)

METHOD EPA 601/602

	#004	#005	#006	#009	#010
	Micrograms/liter				
DATE RUN	11/10/86	11/10	11/10	11/10	11/11
Chloromethane	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND
1,1-dichloroethene	ND	ND	ND	ND	ND
1,1-dichloroethane	ND	ND	ND	ND	ND
trans-1,2-dichloroethene	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND
1,2-dichloroethane	ND	ND	ND	ND	11
1,1,1-trichloroethane	ND	ND	ND	ND	11
Carbon Tetrachloride	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	3
1,2-dichloropropane	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	4
Dibromochloromethane	ND	ND	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	ND	ND
2-chloroethylvinylether	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	2
Benzene	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND
1,3-dichlorobenzene	ND	ND	ND	ND	ND
1,2-dichlorobenzene	ND	ND	ND	ND	ND
1,4-dichlorobenzene	ND	ND	ND	ND	ND

ND = Not Detected

/rk

Princeton Service Center
U.S. Route 1
609-452-9050
TLX 84-3492

princeton testing laboratory

Member

December 2, 1986

FRED C. HART ASSOCIATES

JOB 86GW3506

(See attached sheet for MDL)

METHOD EPA 601/602

	#011	#012	#015	TRIP BLANK
	Micrograms/liter			
DATE RUN	11/11/86	11/11	11/11	11/11
Chloromethane	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND
1,1-dichloroethene	ND	ND	ND	ND
1,1-dichloroethane	ND	ND	ND	ND
trans-1,2-dichloroethene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-dichloroethane	ND	ND	ND	ND
1,1,1-trichloroethane	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND
1,2-dichloropropane	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	ND
2-chloroethylvinylether	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND
Benzene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
1,3-dichlorobenzene	ND	ND	ND	ND
1,2-dichlorobenzene	ND	ND	ND	ND
1,4-dichlorobenzene	DN	ND	ND	ND

ND = Not Detected

/rk

APPENDIX H.1.b

AROMATIC VOLATILE ORGANIC ANALYSIS
RESULTS FOR PTL JOB NO. 86GW3523
WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Volatile Aromatic Solvents - Aqueous - 602

	COMPOUND	DET LMTS	-TRIP BLK.	001	003
71-43-2	Benzene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	2 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	2 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	2 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	2 ug/l	ND	ND	ND
100-41-4	Ethylbenzene	2 ug/l	ND	ND	ND
108-88-3	Toluene	2 ug/l	ND	ND	ND
DATE ANALYZED:			11/13/86	11/12/86	11/12/86
DATE RECEIVED:			10/31/86	10/31/86	10/31/86

ND = NOT DETECTED

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Volatile Aromatic Solvents - Aqueous - 602

	COMPOUND	DET LMTS	007	008	013
71-43-2	Benzene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	2 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	2 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	2 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	2 ug/l	ND	ND	ND
100-41-4	Ethylbenzene	2 ug/l	ND	ND	ND
108-88-3	Toluene	2 ug/l	ND	ND	ND
...					
DATE ANALYZED:			11/12/86	11/12/86	11/12/86
...					
DATE RECEIVED:			10/31/86	10/31/86	10/31/86
...					

ND = NOT DETECTED
...

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Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Volatile Aromatic Solvents - Aqueous - 602

	COMPOUND	DET LMTS	014	017	018
71-43-2	Benzene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	2 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	2 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	2 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	2 ug/l	ND	ND	ND
100-41-4	Ethylbenzene	2 ug/l	ND	ND	ND
108-88-3	Toluene	2 ug/l	ND	ND	ND
...					
DATE ANALYZED:			11/12/86	11/12/86	11/12/86
...					
DATE RECEIVED:			10/31/86	10/31/86	10/31/86
...					

ND = NOT DETECTED
...

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princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Volatile Aromatic Solvents - Aqueous - 602

	COMPOUND	DET LMTS	019	020	021
71-43-2	Benzene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	2 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	2 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	2 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	2 ug/l	ND	ND	ND
100-41-4	Ethylbenzene	2 ug/l	ND	ND	ND
108-88-3	Toluene	2 ug/l	ND	ND	ND
...					
DATE ANALYZED:			11/12/86	11/13/86	11/12/86
...					
DATE RECEIVED:			10/31/86	10/31/86	10/31/86
...					
ND = NOT DETECTED					
...					

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Volatile Aromatic Solvents - Aqueous - 602

	COMPOUND	DET LMTS	022
71-43-2	Benzene	2 ug/l	ND
108-90-7	Chlorobenzene	2 ug/l	ND
95-50-1	1,2-Dichlorobenzene	2 ug/l	ND
541-73-1	1,3-Dichlorobenzene	2 ug/l	ND
106-46-7	1,4-Dichlorobenzene	2 ug/l	ND
100-41-4	Ethylbenzene	2 ug/l	ND
108-88-3	Toluene	2 ug/l	ND

...
DATE ANALYZED: 11/13/86
...
DATE RECEIVED: 10/31/86
...
ND = NOT DETECTED
...

APPENDIX H.1.c

HALOGENATED VOLATILE ORGANIC ANALYSIS
RESULTS FOR PTL JOB NO. 86GW3523
WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	001	003	007
74-87-3	Chloromethane	20 ug/l	ND	ND	ND
74-83-9	Bromomethane	10 ug/l	ND	ND	ND
75-71-8	Dichlorodifluoro-methane	5 ug/l	ND	ND	ND
75-01-4	Vinyl Chloride	2 ug/l	ND	ND	ND
75-00-3	Chloroethane	2 ug/l	ND	ND	ND
75-09-2	Methylene Chloride	5 ug/l	ND	ND	ND
75-69-4	Trichlorofluoro-methane	5 ug/l	ND	ND	ND
			ND	ND	ND
75-35-4	1,1-Dichloroethene	1 ug/l	ND	ND	ND
75-34-3	1,1-Dichloroethane	1 ug/l	ND	ND	ND
156-60-5	trans-1,2-Dichlor-oethene	1 ug/l	ND	ND	ND
67-66-3	Chloroform	2 ug/l	ND	ND	ND
107-06-2	1,2-Dichloroethane	1 ug/l	ND	ND	ND
71-55-6	1,1,1-Trichloro-ethane	2 ug/l	ND	ND	ND
56-23-5	Carbon Tetra-chloride	2 ug/l	ND	ND	ND
75-27-4	Bromodichloro-methane	2 ug/l	ND	ND	ND
78-87-5	1,2-Dichloro-propane	1 ug/l	ND	ND	ND
10061-02-6	trans-1,3-Dichlor-opropene	5 ug/l	ND	ND	ND
79-01-6	Trichloroethene	2 ug/l	ND	ND	ND
124-48-1	Dibromochloro-methane	2 ug/l	ND	ND	ND
79-00-5	1,1,2-Trichloro-ethane	5 ug/l	ND	ND	ND
10061-01-5	cis-1,3-Dichloro-propene	5 ug/l	ND	ND	ND
100-75-8	2-Chloroethyl-vinylether	5 ug/l	ND	ND	ND
75-25-2	Bromoform	10 ug/l	ND	ND	ND
79-34-5	1,1,2,2-Tetra-chloroethane	10 ug/l	ND	ND	ND
127-18-4	Tetrachloroethene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	1 ug/l	ND	ND	ND

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	001	003	007
541-73-1	1,3-Dichloro-benzene	1 ug/l	ND	ND	ND
95-50-1	1,2-Dichloro-benzene	1 ug/l	ND	ND	ND
106-46-7	1,4-Dichloro-benzene	1 ug/l	ND	ND	ND
...					
DATE RUN:			11/12/86	11/12/86	11/12/86
...					
SAMPLE MULTIPLIER:			1	1	1

...
To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

H.1.c.-3

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	008	013	014
74-87-3	Chloromethane	20 ug/l	ND	ND	ND
74-83-9	Bromomethane	10 ug/l	ND	ND	ND
75-71-8	Dichlorodifluoro-methane	5 ug/l	ND	ND	ND
75-01-4	Vinyl Chloride	2 ug/l	ND	ND	ND
75-00-3	Chloroethane	2 ug/l	ND	ND	ND
75-09-2	Methylene Chloride	5 ug/l	ND	ND	ND
75-69-4	Trichlorofluoro-methane	5 ug/l	ND	ND	ND
			ND	ND	ND
75-35-4	1,1-Dichloroethene	1 ug/l	ND	ND	ND
75-34-3	1,1-Dichloroethane	1 ug/l	ND	ND	ND
156-60-5	trans-1,2-Dichlor-oethene	1 ug/l	ND	ND	ND
67-66-3	Chloroform	2 ug/l	ND	ND	ND
107-06-2	1,2-Dichloroethane	1 ug/l	ND	ND	ND
71-55-6	1,1,1-Trichloro-ethane	2 ug/l	ND	ND	ND
56-23-5	Carbon Tetra-chloride	2 ug/l	ND	ND	ND
75-27-4	Bromodichloro-methane	2 ug/l	ND	ND	ND
78-87-5	1,2-Dichloro-propane	1 ug/l	ND	ND	ND
10061-02-6	trans-1,3-Dichlor-opropene	5 ug/l	ND	ND	ND
79-01-6	Trichloroethene	2 ug/l	ND	ND	ND
124-48-1	Dibromochloro-methane	2 ug/l	ND	ND	ND
79-00-5	1,1,2-Trichloro-ethane	5 ug/l	ND	ND	ND
10061-01-5	cis-1,3-Dichloro-propene	5 ug/l	ND	ND	ND
100-75-8	2-Chloroethyl-vinylether	5 ug/l	ND	ND	ND
75-25-2	Bromoform	10 ug/l	ND	ND	ND
79-34-5	1,1,2,2-Tetra-chloroethane	10 ug/l	ND	ND	ND
127-18-4	Tetrachloroethene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	1 ug/l	ND	ND	ND

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	008	013	014
541-73-1	1,3-Dichloro-benzene	1 ug/l	ND	ND	ND
95-50-1	1,2-Dichloro-benzene	1 ug/l	ND	ND	ND
106-46-7	1,4-Dichloro-benzene	1 ug/l	ND	ND	ND
...					
DATE RUN:			11/12/86	11/12/86	11/12/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

Princeton Service Center
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Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88
Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	017	018	019
74-87-3	Chloromethane	20 ug/l	ND	ND	ND
74-83-9	Bromomethane	10 ug/l	ND	ND	ND
75-71-8	Dichlorodifluoro-methane	5 ug/l	ND	ND	ND
75-01-4	Vinyl Chloride	2 ug/l	ND	ND	ND
75-00-3	Chloroethane	2 ug/l	ND	ND	ND
75-09-2	Methylene Chloride	5 ug/l	ND	ND	ND
75-69-4	Trichlorofluoro-methane	5 ug/l	ND	ND	ND
			ND	ND	ND
75-35-4	1,1-Dichloroethene	1 ug/l	ND	ND	ND
75-34-3	1,1-Dichloroethane	1 ug/l	ND	ND	ND
156-60-5	trans-1,2-Dichlor-oethene	1 ug/l	ND	ND	ND
67-66-3	Chloroform	2 ug/l	ND	ND	ND
107-06-2	1,2-Dichloroethane	1 ug/l	ND	ND	ND
71-55-6	1,1,1-Trichloro-ethane	2 ug/l	ND	ND	ND
56-23-5	Carbon Tetra-chloride	2 ug/l	ND	ND	ND
75-27-4	Bromodichloro-methane	2 ug/l	ND	ND	ND
78-87-5	1,2-Dichloro-propane	1 ug/l	ND	ND	ND
10061-02-6	trans-1,3-Dichlor-opropene	5 ug/l	ND	ND	ND
79-01-6	Trichloroethene	2 ug/l	ND	ND	ND
124-48-1	Dibromochloro-methane	2 ug/l	ND	ND	ND
79-00-5	1,1,2-Trichloro-ethane	5 ug/l	ND	ND	ND
10061-01-5	cis-1,3-Dichloro-propene	5 ug/l	ND	ND	ND
100-75-8	2-Chloroethyl-vinylether	5 ug/l	ND	ND	ND
75-25-2	Bromoform	10 ug/l	ND	ND	ND
79-34-5	1,1,2,2-Tetra-chloroethane	10 ug/l	ND	ND	ND
127-18-4	Tetrachloroethene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	1 ug/l	ND	ND	ND

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	017	018	019
541-73-1	1,3-Dichloro-benzene	1 ug/l	ND	ND	ND
95-50-1	1,2-Dichloro-benzene	1 ug/l	ND	ND	ND
106-46-7	1,4-Dichloro-benzene	1 ug/l	ND	ND	ND
...					
DATE RUN:			11/12/86	11/12/86	11/12/86
...					
SAMPLE MULTIPLIER:			1	1	1

...
To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	020	021	022
74-87-3	Chloromethane	20 ug/l	ND	ND	ND
74-83-9	Bromomethane	10 ug/l	ND	ND	ND
75-71-8	Dichlorodifluoro-methane	5 ug/l	ND	ND	ND
75-01-4	Vinyl Chloride	2 ug/l	ND	ND	ND
75-00-3	Chloroethane	2 ug/l	ND	ND	ND
75-09-2	Methylene Chloride	5 ug/l	ND	ND	ND
75-69-4	Trichlorofluoro-methane	5 ug/l	ND	ND	ND
			ND	ND	ND
75-35-4	1,1-Dichloroethene	1 ug/l	ND	ND	ND
75-34-3	1,1-Dichloroethane	1 ug/l	ND	ND	ND
156-60-5	trans-1,2-Dichlor-oethene	1 ug/l	ND	ND	ND
67-66-3	Chloroform	2 ug/l	ND	ND	ND
107-06-2	1,2-Dichloroethane	1 ug/l	ND	ND	ND
71-55-6	1,1,1-Trichloro-ethane	2 ug/l	ND	ND	ND
56-23-5	Carbon Tetra-chloride	2 ug/l	ND	ND	ND
75-27-4	Bromodichloro-methane	2 ug/l	ND	ND	ND
78-87-5	1,2-Dichloro-propane	1 ug/l	ND	ND	ND
10061-02-6	trans-1,3-Dichlor-opropene	5 ug/l	ND	ND	ND
79-01-6	Trichloroethene	2 ug/l	ND	ND	ND
124-48-1	Dibromochloro-methane	2 ug/l	ND	ND	ND
79-00-5	1,1,2-Trichloro-ethane	5 ug/l	ND	ND	ND
10061-01-5	cis-1,3-Dichloro-propene	5 ug/l	ND	ND	ND
100-75-8	2-Chloroethyl-vinylether	5 ug/l	ND	ND	ND
75-25-2	Bromoform	10 ug/l	ND	ND	ND
79-34-5	1,1,2,2-Tetra-chloroethane	10 ug/l	ND	ND	ND
127-18-4	Tetrachloroethene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	1 ug/l	ND	ND	ND

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	020	021	022
541-73-1	1,3-Dichloro-benzene	1 ug/l	ND	ND	ND
95-50-1	1,2-Dichloro-benzene	1 ug/l	ND	ND	ND
106-46-7	1,4-Dichloro-benzene	1 ug/l	ND	ND	ND
...					
DATE RUN:			11/13/86	11/12/86	11/13/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

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(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88
Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	TRIP BLK
74-87-3	Chloromethane	20 ug/l	ND
74-83-9	Bromomethane	10 ug/l	ND
75-71-8	Dichlorodifluoro-methane	5 ug/l	ND
75-01-4	Vinyl Chloride	2 ug/l	ND
75-00-3	Chloroethane	2 ug/l	ND
75-09-2	Methylene Chloride	5 ug/l	ND
75-69-4	Trichlorofluoro-methane	5 ug/l	ND ND
75-35-4	1,1-Dichloroethene	1 ug/l	ND
75-34-3	1,1-Dichloroethane	1 ug/l	ND
156-60-5	trans-1,2-Dichlor-oethene	1 ug/l	ND
67-66-3	Chloroform	2 ug/l	ND
107-06-2	1,2-Dichloroethane	1 ug/l	ND
71-55-6	1,1,1-Trichloro-ethane	2 ug/l	ND
56-23-5	Carbon Tetra-chloride	2 ug/l	ND
75-27-4	Bromodichloro-methane	2 ug/l	ND
78-87-5	1,2-Dichloro-propane	1 ug/l	ND
10061-02-6	trans-1,3-Dichlor-opropene	5 ug/l	ND
79-01-6	Trichloroethene	2 ug/l	ND
124-48-1	Dibromochloro-methane	2 ug/l	ND
79-00-5	1,1,2-Trichloro-ethane	5 ug/l	ND
10061-01-5	cis-1,3-Dichloro-propene	5 ug/l	ND
100-75-8	2-Chloroethyl-vinylether	5 ug/l	ND
75-25-2	Bromoform	10 ug/l	ND
79-34-5	1,1,2,2-Tetra-chloroethane	10 ug/l	ND
127-18-4	Tetrachloroethene	2 ug/l	ND
108-90-7	Chlorobenzene	1 ug/l	ND

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	TRIP BLK.
541-73-1	1,3-Dichloro-benzene	1 ug/l	ND
95-50-1	1,2-Dichloro-benzene	1 ug/l	ND
106-46-7	1,4-Dichloro-benzene	1 ug/l	ND

...

DATE RUN: 11/13/86

...

SAMPLE MULTIPLIER: 1

...

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

APPENDIX H.1.d

AROMATIC VOLATILE ORGANIC ANALYSIS
RESULTS FOR PTL JOB NO. 86GW3538
WATER SAMPLES

(CL5060B/0528N)

H.1.d.-1

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P.O. Box 3108
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(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3538
Date Received: 11/03/86
Units:

TEST PERFORMED: Volatile Aromatic Solvents - Aqueous - 602

	COMPOUND	DET LMTS	023	024	025
71-43-2	Benzene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	2 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	2 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	2 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	2 ug/l	ND	ND	ND
100-41-4	Ethylbenzene	2 ug/l	ND	ND	ND
108-88-3	Toluene	2 ug/l	ND	ND	ND
DATE ANALYZED:			11/13/86	11/13/86	11/13/86
DATE RECEIVED:			11/3/86	11/3/86	11/3/86

ND = NOT DETECTED

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(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88
Job No.: 86GW3538
Date Received: 11/03/86
Units:

TEST PERFORMED: Volatile Aromatic Solvents - Aqueous - 602

	COMPOUND	DET LMTS	026
71-43-2	Benzene	2 ug/l	ND
108-90-7	Chlorobenzene	2 ug/l	ND
95-50-1	1,2-Dichlorobenzene	2 ug/l	ND
541-73-1	1,3-Dichlorobenzene	2 ug/l	ND
106-46-7	1,4-Dichlorobenzene	2 ug/l	ND
100-41-4	Ethylbenzene	2 ug/l	ND
108-88-3	Toluene	2 ug/l	ND

...
DATE ANALYZED: 11/13/86
...
DATE RECEIVED: 11/3/86
...
ND = NOT DETECTED
...

APPENDIX H.1.e

HALOGENATED VOLATILE ORGANIC ANALYSIS
RESULTS FOR PTL JOB NO. 86GW3538
WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
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Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
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(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	023	024	025
74-87-3	Chloromethane	20 ug/l	ND	ND	ND
74-83-9	Bromomethane	10 ug/l	ND	ND	ND
75-71-8	Dichlorodifluoro-methane	5 ug/l	ND	ND	ND
75-01-4	Vinyl Chloride	2 ug/l	ND	ND	ND
75-00-3	Chloroethane	2 ug/l	ND	ND	ND
75-09-2	Methylene Chloride	5 ug/l	ND	ND	ND
75-69-4	Trichlorofluoro-methane	5 ug/l	ND	ND	ND
75-35-4	1,1-Dichloroethene	1 ug/l	ND	ND	ND
75-34-3	1,1-Dichloroethane	1 ug/l	ND	ND	ND
156-60-5	trans-1,2-Dichlor-oethene	1 ug/l	ND	ND	ND
67-66-3	Chloroform	2 ug/l	ND	ND	ND
107-06-2	1,2-Dichloroethane	1 ug/l	ND	ND	ND
71-55-6	1,1,1-Trichloro-ethane	2 ug/l	ND	ND	ND
56-23-5	Carbon Tetra-chloride	2 ug/l	ND	ND	ND
75-27-4	Bromodichloro-methane	2 ug/l	ND	ND	ND
78-87-5	1,2-Dichloro-propane	1 ug/l	ND	ND	ND
10061-02-6	trans-1,3-Dichlor-opropene	5 ug/l	ND	ND	ND
79-01-6	Trichloroethene	2 ug/l	ND	ND	ND
124-48-1	Dibromochloro-methane	2 ug/l	ND	ND	ND
79-00-5	1,1,2-Trichloro-ethane	5 ug/l	ND	ND	ND
10061-01-5	cis-1,3-Dichloro-propene	5 ug/l	ND	ND	ND
100-75-8	2-Chloroethyl-vinylether	5 ug/l	ND	ND	ND
75-25-2	Bromoform	10 ug/l	ND	ND	ND
79-34-5	1,1,2,2-Tetra-chloroethane	10 ug/l	ND	ND	ND
127-18-4	Tetrachloroethene	2 ug/l	ND	ND	ND
108-90-7	Chlorobenzene	1 ug/l	ND	ND	ND

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	023	024	025
541-73-1	1,3-Dichloro-benzene	1 ug/l	ND	ND	ND
95-50-1	1,2-Dichloro-benzene	1 ug/l	ND	ND	ND
106-46-7	1,4-Dichloro-benzene	1 ug/l	ND	ND	ND
...					
DATE ANALYZED:			11/13/86	11/13/86	11/13/86
...					
SAMPLE MULTIPLIER:			1	1	1

...

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

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(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	026
74-87-3	Chloromethane	20 ug/l	ND
74-83-9	Bromomethane	10 ug/l	ND
75-71-8	Dichlorodifluoro-methane	5 ug/l	ND
75-01-4	Vinyl Chloride	2 ug/l	ND
75-00-3	Chloroethane	2 ug/l	ND
75-09-2	Methylene Chloride	5 ug/l	ND
75-69-4	Trichlorofluoro-methane	5 ug/l	ND
75-35-4	1,1-Dichloroethene	1 ug/l	ND
75-34-3	1,1-Dichloroethane	1 ug/l	ND
156-60-5	trans-1,2-Dichlor-oethene	1 ug/l	ND
67-66-3	Chloroform	2 ug/l	ND
107-06-2	1,2-Dichloroethane	1 ug/l	ND
71-55-6	1,1,1-Trichloro-ethane	2 ug/l	ND
56-23-5	Carbon Tetra-chloride	2 ug/l	ND
75-27-4	Bromodichloro-methane	2 ug/l	ND
78-87-5	1,2-Dichloro-propane	1 ug/l	ND
10061-02-6	trans-1,3-Dichlor-opropene	5 ug/l	ND
79-01-6	Trichloroethene	2 ug/l	ND
124-48-1	Dibromochloro-methane	2 ug/l	ND
79-00-5	1,1,2-Trichloro-ethane	5 ug/l	ND
10061-01-5	cis-1,3-Dichloro-propene	5 ug/l	ND
100-75-8	2-Chloroethyl-vinylether	5 ug/l	ND
75-25-2	Bromoform	10 ug/l	ND
79-34-5	1,1,2,2-Tetra-chloroethane	10 ug/l	ND
127-18-4	Tetrachloroethene	2 ug/l	ND
108-90-7	Chlorobenzene	1 ug/l	ND

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(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88
Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Purgeable Halocarbons in Water - Method 601

	COMPOUND	DET LMTS	026
541-73-1	1,3-Dichloro-benzene	1 ug/l	ND
95-50-1	1,2-Dichloro-benzene	1 ug/l	ND
106-46-7	1,4-Dichloro-benzene	1 ug/l	ND
...			
DATE ANALYZED:			11/13/86
...			
SAMPLE MULTIPLIER:			1
...			

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

APPENDIX H.2

AROMATIC AND HALOGENATED VOLATILE
ORGANIC ANALYSES RESULTS FOR SOIL
AND SEDIMENT SAMPLES
(AND A TRIP BLANK SAMPLE)

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
609-452-9050
TLX 84-3492

princeton testing laboratory

Member

Fred C. Hart Associates, Inc.
530 Fifth Ave.
New York, NY 10036
ATTN: Vannessa DeVillez

DATE: December 8, 1986
JOB #: 86GW3440
SAMPLE: Soil 8

EPA 8010/8020 for Soils

ug/kg

SAMPLE RUN:	Hart 001	Hart 002	Hart 003	Hart 004	Hart 005
DATE RUN:	11/03/86	11/03/86	11/03/86	11/03/86	11/03/86
Chloromethane	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND
1,1-dichloroethene	ND	ND	ND	ND	ND
1,1-dichloroethane	ND	ND	ND	ND	ND
trans-1,2-dichloroethene	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND
1,2-dichloroethane	ND	ND	ND	ND	ND
1,1,1-trichloroethane	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND
1,2-dichloropropane	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	ND	ND
2-chloroethylvinylether	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND
Toluene	1100	1200	1400	ND	900
Chlorobenzene	1300	530	1000	ND	3800
Ethylbenzene	1600	2100	3800	ND	2700
1,3-dichlorobenzene ?	750	ND	450	ND	7000
1,2-dichlorobenzene ?	---	ND	---	ND	---
1,4-dichlorobenzene	ND	300	1600	ND	12000

ND = Not Detected
RECEIVED: 10/27/86

MDL on page 4

Nancy S. Dunn, Manager
Organic Laboratory

:cs

Princeton Service Center
U.S. Route 1
609-452-9050
TLX 84-3492

princeton testing laboratory

Member

Fred C. Hart Associates, Inc.
530 Fifth Ave.
New York, NY 10036
ATTN: V. Devillez

DATE: December 8, 1986
JOB #: 86GW3440
SAMPLE: Soil 8
METHOD: EPA 8010/8020

CONFIRMATORY ANALYSIS

ug/kg

SAMPLE RUN:	Hart 002	Hart 003	Hart 005	Fart 007
DATE RUN	11/05/86	11/05/86	11/05/86	11/05/86
Chloromethane	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND
1,1-dichloroethene	ND	ND	ND	ND
1.1-dichloroethane	ND	ND	ND	ND
trans-1,2-dichloroethene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1.2-dichloroethane	ND	ND	ND	ND
1.1,1-trichloroethane	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND
1.2-dichloropropane	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND
1.1,2-trichloroethane	ND	ND	ND	ND
cis-1.3-dichloropropene	ND	ND	ND	ND
2-chloroethylvinylether	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND
1.1.2.2-tetrachloroethane	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	ND
Benzene	ND	ND	1000	ND
Toluene	1200	800	7000	ND
Chlorobenzene	600	1200	4300	ND
Ethylbenzene	1000	5000	3800	ND
1.3-dichlorobenzene	ND	300	11000	ND
1.2-dichlorobenzene	ND	---	----	ND
1.4-dichlorobenzene	600	1200	13000	ND

ND = Not Detected

RECEIVED: 10/27/86

*Confirmation with EPA Method 601/602 using column-N-Octane on 80/100 Poracil C.

NANCY S. DUNN, Manager
Organic Laboratory

:cs

Princeton Service Center
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princeton testing laboratory

Member

Fred C. Hart Associates, Inc.
530 Fifth Ave.
New York, NY 10036
ATTN: V. DeVillez

DATE: December 8, 1986
JOB #: 86GW3440
SAMPLE: Soil 8

EPA 8010/8020 for Soils
ug/kg

Sample Run:	Hart 006	Hart 007	Hart 008
DATE RUN	11/04/86	11/04/86	11/04/86
Chloromethane	ND	ND	ND
Bromomethane	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND
Vinyl Chloride	ND	ND	ND
Chloroethane	ND	ND	ND
Methylene Chloride	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND
1,1-dichloroethene	ND	ND	ND
1,1-dichloroethane	ND	ND	ND
trans-1,2-dichloroethene	ND	ND	ND
Chloroform	ND	ND	ND
1,2-dichloroethane	ND	ND	ND
1,1,1-trichloroethane	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND
Bromodichloromethane	ND	ND	ND
1,2-dichloropropane	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND
Trichloroethene	ND	ND	ND
Dibromochloromethane	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND
2-chloroethylvinylether	ND	ND	ND
Bromoform	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND
Tetrachloroethene	ND	ND	ND
Benzene	200	ND	100
Toluene	2100	ND	2050
Chlorobenzene	2400	ND	2000
Ethylbenzene	4500	ND	4000
1,3-dichlorobenzene	ND	ND	ND
1,2-dichlorobenzene	ND	ND	ND
1,4-dichlorobenzene	4100	ND	4500

ND = Not Detected

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NANCY S. DUNN, Manager
Organic Laboratory

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METHOD DETECTION LIMIT
601/602

	(WATER)		(SOIL)	
Chloromethane	20	Micrograms/liter	800	Micrograms/kg
Bromomethane	10		400	
Dichlorodifluoromethane	5		200	
Vinyl Chloride	2		80	
Chloroethane	2		80	
Methylene Chloride	5		200	
Trichlorofluoromethane	5		200	
1,1-dichloroethene	1		40	
1,1-dichloroethane	1		40	
trans-1,2-dichloroethene	1		40	
Chloroform	2		40	
1,2-dichloroethane	1		40	
1,1,1-trichloroethane	2		80	
Carbon Tetrachloride	2		80	
Bromodichloromethane	2		80	
1,2-dichloropropane	1		40	
trans-1,3-dichloropropene	5		200	
Trichloroethene	2		80	
Dibromochloromethane	2		80	
1,1,2-trichloroethane	5		200	
cis-1,3-dichloropropene	5		200	
2-chloroethylvinylether	5		200	
Bromoform	10		400	
1,1,2,2-tetrachloroethane	10		400	
Tetrachloroethene	2		80	
Benzene	1		40	
Toluene	1		40	
Chlorobenzene	1		40	
Ethylbenzene	1		40	
1,3-dichlorobenzene	1		40	
1,2-dichlorobenzene	1		40	
1,4-dichlorobenzene	1		40	

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Member

Fred C. Hart Associates, Inc.
530 Fifth Ave.
New York, NY 10036
ATTN: V. Devillez

DATE: December 8, 1986
JOB #: 86GW3440
SAMPLE: Water 1

EPA 601/602 for Water
ug/l

SAMPLE RUN:	Trip Blank
DATE RUN	11/04/86
Chloromethane	ND
Bromomethane	ND
Dichlorodifluoromethane	ND
Vinyl Chloride	ND
Chloroethane	ND
Methylene Chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
trans-1,2-dichloroetnene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon Tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
cis-1,3-dichloropropene	ND
2-chloroethylvinylether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Benzene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
1,3-dichlorobenzene	ND
1,2-dichlorobenzene	ND
1,4-dichlorobenzene	ND

ND = Not Detected

RECEIVED: 10/27/86

NANCY S. DUNN, Manager
Organic Laboratory

APPENDIX H.3

ACID AND BASE/NEUTRAL EXTRACTABLE PRIORITY POLLUTANT ORGANIC ANALYSES RESULTS FOR WATER SAMPLES

(CL5060B/0528N)

APPENDIX H.3.a

ACID EXTRACTABLE PRIORITY POLLUTANT
ORGANIC ANALYSIS RESULTS FOR PTL
JOB NO. 86GW3506 WATER SAMPLES

(CL5060B/0528N)

princeton testing laboratory

DATE: December 2, 1986

TO: FRED C. HART ASSOCIATES

JOB NO. 86GW3506

AUTHORIZATION: 01071-00-86008-00

SAMPLE: Water - 5

REPORT OF ANALYSIS

METHOD: 625

ACID EXTRACTS

Micrograms/liter

	#004	#005	#006	#012	#015
Date Run	11/11/86	11/12	11/12	11/12	11/12
2-Chlorophenol	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND
p-chloro-m-cresol	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND

ND = Not Detected

Nancy S. Dunn, Manager
Organic Laboratory

/rk

< less than < ND element is less than the value given and not detected by the technique employed > greater than

APPENDIX H.3.b

BASE/NEUTRAL EXTRACTABLE PRIORITY
POLLUTANT ORGANIC ANALYSIS RESULTS
FOR PTL JOB NO. 86GW3506
WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
609-452-9050
TLX 84-3492

princeton testing laboratory

Member

FRED C. HART ASSOCIATES

December 2, 1986

JOB 86GW3506
PO 01071-00-86008-00

BASE NEUTRAL EXTRACTS

Micrograms/liter

No.	COMPOUND	Det Lmts ug/l	Sample Number #004	#005	#006	#012	#015
1B	Acenaphthene	10	ND	ND	ND	ND	ND
2B	Acenaphthylene	10	ND	ND	ND	ND	ND
3B	Anthracene	10	ND	ND	ND	ND	ND
4B	Benzidine	80	ND	ND	ND	ND	ND
5B	Benzo(a)anthracene	10	ND	ND	ND	ND	ND
6B	Benzo(l) pyrene	10	ND	ND	ND	ND	ND
7B	3,4,-benzofluoranthene	10	ND	ND	ND	ND	ND
8B	Benzo(ghi)perylene	10	ND	ND	ND	ND	ND
9B	Benzo(k)fluoranthene	10	ND	ND	ND	ND	ND
10B	bis(2-chloroethyoxy)methane	10	ND	ND	ND	ND	ND
11B	bis(2-chloroethyl) ether	10	ND	ND	ND	ND	ND
12B	bis(2-chloroisopropyl) ether	10	ND	ND	ND	ND	ND
13B	bis(2-ethylhexyl) phthalate	10	ND	ND	ND	ND	ND
14B	4-bromophenyl phenyl ether	10	ND	ND	ND	ND	ND
15B	Butylbenzyl phthalate	10	ND	ND	ND	ND	ND
16B	2-Chloronaphthalene	10	ND	ND	ND	ND	ND
17B	4-chlorophenyl phenyl ether	20	ND	ND	ND	ND	ND
18B	Chrysene	10	ND	ND	ND	ND	ND
19B	Dibenzo(a,h)anthracene	10	ND	ND	ND	ND	ND
20B	1,2-Dichlorobenzene	10	ND	ND	ND	ND	ND
21B	1,3-Dichlorobenzene	10	ND	ND	ND	ND	ND
22B	1,4-Dichlorobenzene	10	ND	ND	ND	ND	ND
23B	3,3-Dichlorobenzidine	20	ND	ND	ND	ND	ND
24B	Diethyl phthalate	10	ND	ND	ND	ND	ND
25B	Dimethyl phthalate	10	ND	ND	ND	ND	ND
26B	Di-n-butyl phthalate	10	ND	ND	ND	ND	ND
27B	2,4-Dinitrotoluene	10	ND	ND	ND	ND	ND
28B	2,6-Dinitrotoluene	10	ND	ND	ND	ND	ND
29B	Di-n-octyl phthalate	10	ND	ND	ND	ND	ND
30B	1,2-diphenylhydrazine (as azobenzene)	10	ND	ND	ND	ND	ND
31B	Fluoranthene	10	ND	ND	ND	ND	ND
32B	Fluorene	10	ND	ND	ND	ND	ND
33B	Hexachlorobenzene	10	ND	ND	ND	ND	ND
	Date Run		11/11/86	11/12	11/12	11/12	11/12
	Sample Multiplier		1	1	1	1	1

Continued...

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Member

December 2, 1986

FRED C. HART ASSOCIATES

JOB 86GW3506
PO 01071-00-86008-00

BASE NEUTRAL EXTRACTS
(Continued)
Micrograms/liter

No.	COMPOUND	Sample Number / Det Lmts ug/l	#004	#005	#006	#012	#015
34B	Hexchlorobutadiene	10	ND	ND	ND	ND	ND
35B	Hexachlorocyclopentadiene	10	ND	ND	ND	ND	ND
36B	Hexachloroethane	10	ND	ND	ND	ND	ND
37B	Ideno(1,2,3-cd)pyrene	10	ND	ND	ND	ND	ND
38B	Isophorone	10	ND	ND	ND	ND	ND
39B	Naphthalene	10	ND	ND	ND	ND	ND
40B	Nitrobenzene	10	ND	ND	ND	ND	ND
41B	N-nitrosodimethylamine	10	ND	ND	ND	ND	ND
42B	N-nitrosodi-n-propylamine	10	ND	ND	ND	ND	ND
43B	N-nitrosodiphenylamine	10	ND	ND	ND	ND	ND
44B	Phenanthrene	10	ND	ND	ND	ND	ND
45B	Pyrene	10	ND	ND	ND	ND	ND
46B	1,2,4-Trichlorobenzene	10	ND	ND	ND	ND	ND

SURROGATE RECOVERY DATA
% RECOVERY

1	2-Fluorophenol	70	99	86	76	78
2	D5-Phenol	69	71	61	49	49
3	D5-Nitrobenzene	53	42	35	35	26
4	2-Fluorobiphenyl	86	78	40	34	31
5	2,4,6-Tribromophenol	100	161	212	174	173

ND = Not Detected
METHOD: 625
MATRIX: Water

To obtain MDL for each sample, multiply "sample multiplier" times detection limit for each parameter.

APPENDIX H.3.c

ACID EXTRACTABLE PRIORITY POLLUTANT
ORGANIC ANALYSIS RESULTS FOR PTL
JOB NO. 86GW3523 WATER SAMPLES

(CL5060B/0528N)

H.3.c.-1

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Acid Extractables - Aqueous - Method 625

	COMPOUND	DET LMTS	-3523 BLK.	001	003
95-57-8	2-Chlorophenol	10 ug/l	ND	ND	ND
88-75-5	2-Nitrophenol	10 ug/l	ND	ND	ND
108-95-2	Phenol	10 ug/l	ND	ND	ND
105-67-9	2,4-Dimethylphenol	10 ug/l	ND	ND	ND
120-83-2	2,4-Dichlorophenol	10 ug/l	ND	ND	ND
88-06-2	2,4,6-Trichloro-phenol	10 ug/l	ND	ND	ND
59-50-7	4 Chloro-3-methylphenol	10 ug/l	ND	ND	ND
51-28-5	2,4-Dinitrophenol	50 ug/l	ND	ND	ND
534-52-1	2-Methyl-4,6-Dinitrophenol	50 ug/l	ND	ND	ND
87-86-5	Pentachlorophenol	50 ug/l	ND	ND	ND
100-02-7	4-Nitrophenol	50 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol					
D5-Phenol					
D5-Nitrobenzene					
2-Fluorobiphenyl					
2,4,6-Tribromophenol					
...					
...					
DATE ANALYZED:			11/11/86	11/11/86	11/11/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

H.3.c.-2

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Acid Extractables - Aqueous - Method 625

	COMPOUND	DET LMTS	007	008	013
95-57-8	2-Chlorophenol	10 ug/l	ND	ND	ND
88-75-5	2-Nitrophenol	10 ug/l	ND	ND	ND
108-95-2	Phenol	10 ug/l	ND	ND	ND
105-67-9	2,4-Dimethylphenol	10 ug/l	ND	ND	ND
120-83-2	2,4-Dichlorophenol	10 ug/l	ND	ND	ND
88-06-2	2,4,6-Trichloro-phenol	10 ug/l	ND	ND	ND
59-50-7	4 Chloro-3-methylphenol	10 ug/l	ND	ND	ND
51-28-5	2,4-Dinitrophenol	50 ug/l	ND	ND	ND
534-52-1	2-Methyl-4,6-Dinitrophenol	50 ug/l	ND	ND	ND
87-86-5	Pentachlorophenol	50 ug/l	ND	ND	ND
100-02-7	4-Nitrophenol	50 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol					
D5-Phenol					
D5-Nitrobenzene					
2-Fluorobiphenyl					
2,4,6-Tribromophenol					
...					
...					
DATE ANALYZED:			11/12/86	11/11/86	11/12/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/85
Units: ug/l

TEST PERFORMED: Acid Extractables - Aqueous - Method 625

	COMPOUND	DET LMTS	014	017	018
95-57-8	2-Chlorophenol	10 ug/l	ND	ND	ND
88-75-5	2-Nitrophenol	10 ug/l	ND	ND	ND
108-95-2	Phenol	10 ug/l	ND	ND	ND
105-67-9	2,4-Dimethylphenol	10 ug/l	ND	ND	ND
120-83-2	2,4-Dichlorophenol	10 ug/l	ND	ND	ND
88-06-2	2,4,6-Trichloro-phenol	10 ug/l	ND	ND	ND
59-50-7	4 Chloro-3-methylphenol	10 ug/l	ND	ND	ND
51-28-5	2,4-Dinitrophenol	50 ug/l	ND	ND	ND
534-52-1	2-Methyl-4,6-Dinitrophenol	50 ug/l	ND	ND	ND
87-86-5	Pentachlorophenol	50 ug/l	ND	ND	ND
100-02-7	4-Nitrophenol	50 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol					
D5-Phenol					
D5-Nitrobenzene					
2-Fluorobiphenyl					
2,4,6-Tribromophenol					
...					
...					
DATE ANALYZED:			11/11/86	11/12/86	11/11/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Acid Extractables - Aqueous - Method 625

	COMPOUND	DET LMTS	019	020	021
95-57-8	2-Chlorophenol	10 ug/l	ND	ND	ND
88-75-5	2-Nitrophenol	10 ug/l	ND	ND	ND
108-95-2	Phenol	10 ug/l	ND	ND	ND
105-67-9	2,4-Dimethylphenol	10 ug/l	ND	ND	ND
120-83-2	2,4-Dichlorophenol	10 ug/l	ND	ND	ND
88-06-2	2,4,6-Trichloro-phenol	10 ug/l	ND	ND	ND
59-50-7	4 Chloro-3-methylphenol	10 ug/l	ND	ND	ND
51-28-5	2,4-Dinitrophenol	50 ug/l	ND	ND	ND
534-52-1	2-Methyl-4,6-Dinitrophenol	50 ug/l	ND	ND	ND
87-86-5	Pentachlorophenol	50 ug/l	ND	ND	ND
100-02-7	4-Nitrophenol	50 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol					
D5-Phenol					
D5-Nitrobenzene					
2-Fluorobiphenyl					
2,4,6-Tribromophenol					
...					
...					
DATE ANALYZED:			11/12/86	11/12/86	11/11/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

APPENDIX H.3.d

BASE/NEUTRAL EXTRACTABLE PRIORITY
POLLUTANT ORGANIC ANALYSIS RESULTS
FOR PTL JOB NO. 86GW3523
WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	-3523 BLK.	001	003
83-32-9	Acenaphthene	10 ug/l	ND	ND	ND
208-96-8	Acenaphthylene	10 ug/l	ND	ND	ND
120-12-7	Anthracene	10 ug/l	ND	ND	ND
92-87-5	Benzidine	80 ug/l	ND	ND	ND
56-55-3	Benzo(a)anthracene	10 ug/l	ND	ND	ND
50-32-8	Benzo(a)pyrene	10 ug/l	ND	ND	ND
205-99-2	Benzo(b)fluoranthene	10 ug/l	ND	ND	ND
191-24-2	Benzo(ghi)perylene	10 ug/l	ND	ND	ND
207-08-9	Benzo(k)fluoranthene	10 ug/l	ND	ND	ND
111-91-1	bis(2-Chloroethoxy) methane	10 ug/l	ND	ND	ND
111-44-4	bis(2-Chloroethyl) ether	10 ug/l	ND	ND	ND
108-60-1	bis(2-Chloro-isopropyl)ether	10 ug/l	ND	ND	ND
117-81-7	bis(2-Ethylhexyl) phthalate	10 ug/l	ND	ND	ND
101-55-3	4-Bromophenyl phenyl ether	10 ug/l	ND	ND	ND
85-68-7	Butylbenzyl phthalate	10 ug/l	ND	ND	ND
91-58-7	2-Chloronaphthalene	10 ug/l	ND	ND	ND
7005-72-3	4-Chlorophenyl phenyl ether	20 ug/l	ND	ND	ND
218-01-9	Chrysene	10 ug/l	ND	ND	ND
53-70-3	Dibenzo(a,h) anthracene	10 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	10 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	10 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	10 ug/l	ND	ND	ND
91-94-1	3,3'-Dichloro-benzidine	20 ug/l	ND	ND	ND
84-66-2	Diethyl phthalate	10 ug/l	ND	ND	ND
131-11-3	Dimethyl phthalate	10 ug/l	ND	ND	ND
84-74-2	Di-n-Dibutyl phthalate	10 ug/l	ND	ND	ND
121-14-2	2,4-Dinitrotoluene	10 ug/l	ND	ND	ND
606-20-2	2,6-Dinitrotoluene	10 ug/l	ND	ND	ND
117-84-0	di-n-octyl phthalate	10 ug/l	ND	ND	ND
206-44-0	Fluoranthene	10 ug/l	ND	ND	ND

Princeton Service Center
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P.O. Box 3108
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(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	-3523 BLK.	001	003
86-73-7	Fluorene	10 ug/l	ND	ND	ND
118-74-1	Hexachlorobenzene	10 ug/l	ND	ND	ND
87-68-3	Hexachlorobutadiene	10 ug/l	ND	ND	ND
77-47-4	Hexachlorocyclo-pentadiene	10 ug/l	ND	ND	ND
67-72-1	Hexachloroethane	10 ug/l	ND	ND	ND
193-39-5	Indeno (1,2,3-cd) pyrene	10 ug/l	ND	ND	ND
78-59-1	Isophorone	10 ug/l	ND	ND	ND
91-20-31	Naphthalene	10 ug/l	ND	ND	ND
98-95-3	Nitrobenzene	10 ug/l	ND	ND	ND
62-75-9	N-nitrosodimethyl-amine	10 ug/l	ND	ND	ND
621-64-7	N-nitrosodi-n-propylamine	10 ug/l	ND	ND	ND
86-30-6	N-nitrosodiphenyl-amine	10 ug/l	ND	ND	ND
85-01-8	Phenanthrene	10 ug/l	ND	ND	ND
129-00-0	Pyrene	10 ug/l	ND	ND	ND
120-82-1	1,2,4-Trichloro-benzene	10 ug/l	ND	ND	ND

...
...

SURROGATE RECOVERY DATA
% RECOVERY

...
...

2-Fluorophenol	44	119	118
D5-Phenol	37	67	67
D5-Nitrobenzene	25	48	42
2-Fluorobiphenyl	45	55	53
2,4,6-Tribromophenol	161	213	192
...			
DATE ANALYZED:	11/11/86	11/11/86	11/11/86
SAMPLE MULTIPLIER:	1	1	1

...

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	007	008	013
83-32-9	Acenaphthene	10 ug/l	ND	ND	ND
208-96-8	Acenaphthylene	10 ug/l	ND	ND	ND
120-12-7	Anthracene	10 ug/l	ND	ND	ND
92-87-5	Benzidine	80 ug/l	ND	ND	ND
56-55-3	Benzo(a)anthracene	10 ug/l	ND	ND	ND
50-32-8	Benzo(a)pyrene	10 ug/l	ND	ND	ND
205-99-2	Benzo(b)fluoranthene	10 ug/l	ND	ND	ND
191-24-2	Benzo(ghi)perylene	10 ug/l	ND	ND	ND
207-08-9	Benzo(k)fluoranthene	10 ug/l	ND	ND	ND
111-91-1	bis(2-Chloroethoxy) methane	10 ug/l	ND	ND	ND
111-44-4	bis(2-Chloroethyl) ether	10 ug/l	ND	ND	ND
108-60-1	bis(2-Chloro-isopropyl)ether	10 ug/l	ND	ND	ND
117-81-7	bis(2-Ethylhexyl) phthalate	10 ug/l	ND	ND	ND
101-55-3	4-Bromophenyl phenyl ether	10 ug/l	ND	ND	ND
85-68-7	Butylbenzyl phthalate	10 ug/l	ND	ND	ND
91-58-7	2-Chloronaphthalene	10 ug/l	ND	ND	ND
7005-72-3	4-Chlorophenyl phenyl ether	20 ug/l	ND	ND	ND
218-01-9	Chrysene	10 ug/l	ND	ND	ND
53-70-3	Dibenzo(a,h) anthracene	10 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	10 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	10 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	10 ug/l	ND	ND	ND
91-94-1	3,3'-Dichloro-benzidine	20 ug/l	ND	ND	ND
84-66-2	Diethyl phthalate	10 ug/l	ND	ND	ND
131-11-3	Dimethyl phthalate	10 ug/l	ND	ND	ND
84-74-2	Di-n-Dibutyl phthalate	10 ug/l	ND	ND	ND
121-14-2	2,4-Dinitrotoluene	10 ug/l	ND	ND	ND
606-20-2	2,6-Dinitrotoluene	10 ug/l	ND	ND	ND
117-84-0	di-n-octyl phthalate	10 ug/l	ND	ND	ND
206-44-0	Fluoranthene	10 ug/l	ND	ND	ND

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Princeton, NJ 08543-3108
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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	007	008	013
86-73-7	Fluorene	10 ug/l	ND	ND	ND
118-74-1	Hexachlorobenzene	10 ug/l	ND	ND	ND
87-68-3	Hexachlorobutadiene	10 ug/l	ND	ND	ND
77-47-4	Hexachlorocyclo-pentadiene	10 ug/l	ND	ND	ND
67-72-1	Hexachloroethane	10 ug/l	ND	ND	ND
193-39-5	Indeno (1,2,3-cd) pyrene	10 ug/l	ND	ND	ND
78-59-1	Isophorone	10 ug/l	ND	ND	ND
91-20-31	Naphthalene	10 ug/l	ND	ND	ND
98-95-3	Nitrobenzene	10 ug/l	ND	ND	ND
62-75-9	N-nitrosodimethyl-amine	10 ug/l	ND	ND	ND
621-64-7	N-nitrosodi-n-propylamine	10 ug/l	ND	ND	ND
86-30-6	N-nitrosodiphenyl-amine	10 ug/l	ND	ND	ND
85-01-8	Phenanthrene	10 ug/l	ND	ND	ND
129-00-0	Pyrene	10 ug/l	ND	ND	ND
120-82-1	1,2,4-Trichloro-benzene	10 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol			125	80	176
D5-Phenol			71	50	150
D5-Nitrobenzene			48	25	41
2-Fluorobiphenyl			59	35	55
2,4,6-Tribromophenol			190	219	177
...					
DATE ANALYZED:			11/12/86	11/11/86	11/12/86
SAMPLE MULTIPLIER:			1	1	1

...
To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

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Princeton, NJ 08543-3108
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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	014	017	018
83-32-9	Acenaphthene	10 ug/l	ND	ND	ND
208-96-8	Acenaphthylene	10 ug/l	ND	ND	ND
120-12-7	Anthracene	10 ug/l	ND	ND	ND
92-87-5	Benzidine	80 ug/l	ND	ND	ND
56-55-3	Benzo(a)anthracene	10 ug/l	ND	ND	ND
50-32-8	Benzo(a)pyrene	10 ug/l	ND	ND	ND
205-99-2	Benzo(b)fluoranthene	10 ug/l	ND	ND	ND
191-24-2	Benzo(ghi)perylene	10 ug/l	ND	ND	ND
207-08-9	Benzo(k)fluoranthene	10 ug/l	ND	ND	ND
111-91-1	bis(2-Chloroethoxy) methane	10 ug/l	ND	ND	ND
111-44-4	bis(2-Chloroethyl) ether	10 ug/l	ND	ND	ND
108-60-1	bis(2-Chloro-isopropyl)ether	10 ug/l	ND	ND	ND
117-81-7	bis(2-Ethylhexyl) phthalate	10 ug/l	ND	ND	ND
101-55-3	4-Bromophenyl phenyl ether	10 ug/l	ND	ND	ND
85-68-7	Butylbenzyl phthalate	10 ug/l	ND	ND	ND
91-58-7	2-Chloronaphthalene	10 ug/l	ND	ND	ND
7005-72-3	4-Chlorophenyl phenyl ether	20 ug/l	ND	ND	ND
218-01-9	Chrysene	10 ug/l	ND	ND	ND
53-70-3	Dibenzo(a,h) anthracene	10 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	10 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	10 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	10 ug/l	ND	ND	ND
91-94-1	3,3'-Dichloro-benzidine	20 ug/l	ND	ND	ND
84-66-2	Diethyl phthalate	10 ug/l	ND	ND	ND
131-11-3	Dimethyl phthalate	10 ug/l	ND	ND	ND
84-74-2	Di-n-Dibutyl phthalate	10 ug/l	ND	ND	ND
121-14-2	2,4-Dinitrotoluene	10 ug/l	ND	ND	ND
606-20-2	2,6-Dinitrotoluene	10 ug/l	ND	ND	ND
117-84-0	di-n-octyl phthalate	10 ug/l	ND	ND	ND
206-44-0	Fluoranthene	10 ug/l	ND	ND	ND

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Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	014	017	018
86-73-7	Fluorene	10 ug/l	ND	ND	ND
118-74-1	Hexachlorobenzene	10 ug/l	ND	ND	ND
87-68-3	Hexachlorobutadiene	10 ug/l	ND	ND	ND
77-47-4	Hexachlorocyclo-pentadiene	10 ug/l	ND	ND	ND
67-72-1	Hexachloroethane	10 ug/l	ND	ND	ND
193-39-5	Indeno (1,2,3-cd) pyrene	10 ug/l	ND	ND	ND
78-59-1	Isophorone	10 ug/l	ND	ND	ND
91-20-31	Naphthalene	10 ug/l	ND	ND	ND
98-95-3	Nitrobenzene	10 ug/l	ND	ND	ND
62-75-9	N-nitrosodimethyl-amine	10 ug/l	ND	ND	ND
621-64-7	N-nitrosodi-n-propylamine	10 ug/l	ND	ND	ND
86-30-6	N-nitrosodiphenyl-amine	10 ug/l	ND	ND	ND
85-01-8	Phenanthrene	10 ug/l	ND	ND	ND
129-00-0	Pyrene	10 ug/l	ND	ND	ND
120-82-1	1,2,4-Trichloro-benzene	10 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol			86	38	35
D5-Phenol			52	22	26
D5-Nitrobenzene			44	36	46
2-Fluorobiphenyl			51	43	56
2,4,6-Tribromophenol			230	198	144
...					
DATE ANALYZED:			11/11/86	11/12/86	11/11/86
SAMPLE MULTIPLIER:			1	1	1

...

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	019	020	021
83-32-9	Acenaphthene	10 ug/l	ND	ND	ND
208-96-8	Acenaphthylene	10 ug/l	ND	ND	ND
120-12-7	Anthracene	10 ug/l	ND	ND	ND
92-87-5	Benzidine	80 ug/l	ND	ND	ND
56-55-3	Benzo(a)anthracene	10 ug/l	ND	ND	ND
50-32-8	Benzo(a)pyrene	10 ug/l	ND	ND	ND
205-99-2	Benzo(b)fluoranthene	10 ug/l	ND	ND	ND
191-24-2	Benzo(ghi)perylene	10 ug/l	ND	ND	ND
207-08-9	Benzo(k)fluoranthene	10 ug/l	ND	ND	ND
111-91-1	bis(2-Chloroethoxy) methane	10 ug/l	ND	ND	ND
111-44-4	bis(2-Chloroethyl) ether	10 ug/l	ND	ND	ND
108-60-1	bis(2-Chloro-isopropyl)ether	10 ug/l	ND	ND	ND
117-81-7	bis(2-Ethylhexyl) phthalate	10 ug/l	ND	ND	ND
101-55-3	4-Bromophenyl phenyl ether	10 ug/l	ND	ND	ND
85-68-7	Butylbenzyl phthalate	10 ug/l	ND	ND	ND
91-58-7	2-Chloronaphthalene	10 ug/l	ND	ND	ND
7005-72-3	4-Chlorophenyl phenyl ether	20 ug/l	ND	ND	ND
218-01-9	Chrysene	10 ug/l	ND	ND	ND
53-70-3	Dibenzo(a,h) anthracene	10 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	10 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	10 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	10 ug/l	ND	ND	ND
91-94-1	3,3'-Dichloro-benzidine	20 ug/l	ND	ND	ND
84-66-2	Diethyl phthalate	10 ug/l	ND	ND	ND
131-11-3	Dimethyl phthalate	10 ug/l	ND	ND	ND
84-74-2	Di-n-Dibutyl phthalate	10 ug/l	ND	ND	ND
121-14-2	2,4-Dinitrotoluene	10 ug/l	ND	ND	ND
606-20-2	2,6-Dinitrotoluene	10 ug/l	ND	ND	ND
117-84-0	di-n-octyl phthalate	10 ug/l	ND	ND	ND
206-44-0	Fluoranthene	10 ug/l	ND	ND	ND

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
NEW YORK NY 10036

Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3523
Date Received: 10/31/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	019	020	021
86-73-7	Fluorene	10 ug/l	ND	ND	ND
118-74-1	Hexachlorobenzene	10 ug/l	ND	ND	ND
87-68-3	Hexachlorobutadiene	10 ug/l	ND	ND	ND
77-47-4	Hexachlorocyclo-pentadiene	10 ug/l	ND	ND	ND
67-72-1	Hexachloroethane	10 ug/l	ND	ND	ND
193-39-5	Indeno (1,2,3-cd) pyrene	10 ug/l	ND	ND	ND
78-59-1	Isophorone	10 ug/l	ND	ND	ND
91-20-31	Naphthalene	10 ug/l	ND	ND	ND
98-95-3	Nitrobenzene	10 ug/l	ND	ND	ND
62-75-9	N-nitrosodimethyl-amine	10 ug/l	ND	ND	ND
621-64-7	N-nitrosodi-n-propylamine	10 ug/l	ND	ND	ND
86-30-6	N-nitrosodiphenyl-amine	10 ug/l	ND	ND	ND
85-01-8	Phenanthrene	10 ug/l	ND	ND	ND
129-00-0	Pyrene	10 ug/l	ND	ND	ND
120-82-1	1,2,4-Trichloro-benzene	10 ug/l	ND	ND	ND

...
...
SURROGATE RECOVERY DATA
% RECOVERY
...
...

2-Fluorophenol	80	111	76
D5-Phenol	44	74	45
D5-Nitrobenzene	30	36	49
2-Fluorobiphenyl	38	45	60
2,4,6-Tribromophenol	218	158	217
...			
DATE ANALYZED:	11/12/86	11/12/86	11/11/86
SAMPLE MULTIPLIER:	1	1	1

...
To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

APPENDIX H.3.e

ACID EXTRACTABLE PRIORITY POLLUTANT
ORGANIC ANALYSIS RESULTS FOR PTL
JOB NO. 86GW3538 WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88
Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Acid Extractables - Aqueous - Method 625

	COMPOUND	DET LMTS	-BLANK	023	024
95-57-8	2-Chlorophenol	10 ug/l	ND	ND	ND
88-75-5	2-Nitrophenol	10 ug/l	ND	ND	ND
108-95-2	Phenol	10 ug/l	ND	ND	ND
105-67-9	2,4-Dimethylphenol	10 ug/l	ND	ND	ND
120-83-2	2,4-Dichlorophenol	10 ug/l	ND	ND	ND
88-06-2	2,4,6-Trichloro-phenol	10 ug/l	ND	ND	ND
59-50-7	4 Chloro-3-methylphenol	10 ug/l	ND	ND	ND
51-28-5	2,4-Dinitrophenol	50 ug/l	ND	ND	ND
534-52-1	2-Methyl-4,6-Dinitrophenol	50 ug/l	ND	ND	ND
87-86-5	Pentachlorophenol	50 ug/l	ND	ND	ND
100-02-7	4-Nitrophenol	50 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol					
D5-Phenol					
D5-Nitrobenzene					
2-Fluorobiphenyl					
2,4,6-Tribromophenol					
...					
...					
DATE ANALYZED:			11/11/86	11/11/86	11/11/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

H.3.e.-2

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U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Acid Extractables - Aqueous - Method 625

	COMPOUND	DET LMTS	025	026	027
95-57-8	2-Chlorophenol	10 ug/l	ND	ND	ND
88-75-5	2-Nitrophenol	10 ug/l	ND	ND	ND
108-95-2	Phenol	10 ug/l	ND	ND	ND
105-67-9	2,4-Dimethylphenol	10 ug/l	ND	ND	ND
120-83-2	2,4-Dichlorophenol	10 ug/l	ND	ND	ND
88-06-2	2,4,6-Trichloro-phenol	10 ug/l	ND	ND	ND
59-50-7	4 Chloro-3-methylphenol	10 ug/l	ND	ND	ND
51-28-5	2,4-Dinitrophenol	50 ug/l	ND	ND	ND
534-52-1	2-Methyl-4,6-Dinitrophenol	50 ug/l	ND	ND	ND
87-86-5	Pentachlorophenol	50 ug/l	ND	ND	ND
100-02-7	4-Nitrophenol	50 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol					
D5-Phenol					
D5-Nitrobenzene					
2-Fluorobiphenyl					
2,4,6-Tribromophenol					
...					
...					
DATE ANALYZED:			11/11/86	11/12/86	11/11/86
...					
SAMPLE MULTIPLIER:			1	1	1
...					
...					

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

APPENDIX H.3.f

BASE/NEUTRAL EXTRACTABLE PRIORITY POLLUTANT
ORGANIC ANALYSIS RESULTS FOR PTL
JOB NO. 86GW3538 WATER SAMPLES

(CL5060B/0528N)

Princeton Service Center
U.S. Route 1
Princeton, NJ 08540

princeton testing laboratory inc.

P.O. Box 3108
Princeton, NJ 08543-3108
(609) 452-9050

SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88
Job No.: 85GW3538
Date Received: 11/03/85
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	-BLANK	023	024
83-32-9	Acenaphthene	10 ug/l	ND	ND	ND
208-96-8	Acenaphthylene	10 ug/l	ND	ND	ND
120-12-7	Anthracene	10 ug/l	ND	ND	ND
92-87-5	Benzidine	80 ug/l	ND	ND	ND
56-55-3	Benzo(a)anthracene	10 ug/l	ND	ND	ND
50-32-8	Benzo(a)pyrene	10 ug/l	ND	ND	ND
205-99-2	Benzo(b)fluoranthene	10 ug/l	ND	ND	ND
191-24-2	Benzo(ghi)perylene	10 ug/l	ND	ND	ND
207-08-9	Benzo(k)fluoranthene	10 ug/l	ND	ND	ND
111-91-1	bis(2-Chloroethoxy) methane	10 ug/l	ND	ND	ND
111-44-4	bis(2-Chloroethyl) ether	10 ug/l	ND	ND	ND
108-60-1	bis(2-Chloro-isopropyl)ether	10 ug/l	ND	ND	ND
117-81-7	bis(2-Ethylhexyl) phthalate	10 ug/l	ND	ND	ND
101-55-3	4-Bromophenyl phenyl ether	10 ug/l	ND	ND	ND
85-68-7	Butylbenzyl phthalate	10 ug/l	ND	ND	ND
91-58-7	2-Chloronaphthalene	10 ug/l	ND	ND	ND
7005-72-3	4-Chlorophenyl phenyl ether	20 ug/l	ND	ND	ND
218-01-9	Chrysene	10 ug/l	ND	ND	ND
53-70-3	Dibenzo(a,h) anthracene	10 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	10 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	10 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	10 ug/l	ND	ND	ND
91-94-1	3,3'-Dichloro-benzidine	20 ug/l	ND	ND	ND
84-66-2	Diethyl phthalate	10 ug/l	ND	ND	ND
131-11-3	Dimethyl phthalate	10 ug/l	ND	ND	ND
84-74-2	Di-n-Dibutyl phthalate	10 ug/l	ND	ND	ND
121-14-2	2,4-Dinitrotoluene	10 ug/l	ND	ND	ND
606-20-2	2,6-Dinitrotoluene	10 ug/l	ND	ND	ND
117-84-0	di-n-octyl phthalate	10 ug/l	ND	ND	ND
206-44-0	Fluoranthene	10 ug/l	ND	ND	ND

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88
Job No.: 8SGW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	-BLANK	023	024
86-73-7	Fluorene	10 ug/l	ND	ND	ND
118-74-1	Hexachlorobenzene	10 ug/l	ND	ND	ND
87-68-3	Hexachlorobutadiene	10 ug/l	ND	ND	ND
77-47-4	Hexachlorocyclo-pentadiene	10 ug/l	ND	ND	ND
67-72-1	Hexachloroethane	10 ug/l	ND	ND	ND
193-39-5	Indeno (1,2,3-cd) pyrene	10 ug/l	ND	ND	ND
78-59-1	Isophorone	10 ug/l	ND	ND	ND
91-20-31	Naphthalene	10 ug/l	ND	ND	ND
98-95-3	Nitrobenzene	10 ug/l	ND	ND	ND
62-75-9	N-nitrosodimethyl-amine	10 ug/l	ND	ND	ND
621-64-7	N-nitrosodi-n-propylamine	10 ug/l	ND	ND	ND
86-30-6	N-nitrosodiphenyl-amine	10 ug/l	ND	ND	ND
85-01-8	Phenanthrene	10 ug/l	ND	ND	ND
129-00-0	Pyrene	10 ug/l	ND	ND	ND
120-82-1	1,2,4-Trichloro-benzene	10 ug/l	ND	ND	ND

...
...

SURROGATE RECOVERY DATA
% RECOVERY

...
...

2-Fluorophenol	132	111	109
D5-Phenol	71	67	70
D5-Nitrobenzene	39	39	41
2-Fluorobiphenyl	50	47	52
2,4,6-Tribromophenol	219	230	171
...			
DATE ANALYZED:	11/11/86	11/11/86	11/11/86
SAMPLE MULTIPLIER:	1	1	1

...
To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	025	026	027
83-32-9	Acenaphthene	10 ug/l	ND	ND	ND
208-96-8	Acenaphthylene	10 ug/l	ND	ND	ND
120-12-7	Anthracene	10 ug/l	ND	ND	ND
92-87-5	Benzidine	80 ug/l	ND	ND	ND
56-55-3	Benzo(a)anthracene	10 ug/l	ND	ND	ND
50-32-8	Benzo(a)pyrene	10 ug/l	ND	ND	ND
205-99-2	Benzo(b)fluoranthene	10 ug/l	ND	ND	ND
191-24-2	Benzo(ghi)perylene	10 ug/l	ND	ND	ND
207-08-9	Benzo(k)fluoranthene	10 ug/l	ND	ND	ND
111-91-1	bis(2-Chloroethoxy) methane	10 ug/l	ND	ND	ND
111-44-4	bis(2-Chloroethyl) ether	10 ug/l	ND	ND	ND
108-60-1	bis(2-Chloro-isopropyl)ether	10 ug/l	ND	ND	ND
117-81-7	bis(2-Ethylhexyl) phthalate	10 ug/l	ND	ND	ND
101-55-3	4-Bromophenyl phenyl ether	10 ug/l	ND	ND	ND
85-68-7	Butylbenzyl phthalate	10 ug/l	ND	ND	ND
91-58-7	2-Chloronaphthalene	10 ug/l	ND	ND	ND
7005-72-3	4-Chlorophenyl phenyl ether	20 ug/l	ND	ND	ND
218-01-9	Chrysene	10 ug/l	ND	ND	ND
53-70-3	Dibenzo(a,h) anthracene	10 ug/l	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	10 ug/l	ND	ND	ND
541-73-1	1,3-Dichlorobenzene	10 ug/l	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	10 ug/l	ND	ND	ND
91-94-1	3,3'-Dichloro-benzidine	20 ug/l	ND	ND	ND
84-66-2	Diethyl phthalate	10 ug/l	ND	ND	ND
131-11-3	Dimethyl phthalate	10 ug/l	ND	ND	ND
84-74-2	Di-n-Dibutyl phthalate	10 ug/l	ND	ND	ND
121-14-2	2,4-Dinitrotoluene	10 ug/l	ND	ND	ND
606-20-2	2,6-Dinitrotoluene	10 ug/l	ND	ND	ND
117-84-0	di-n-octyl phthalate	10 ug/l	ND	ND	ND
206-44-0	Fluoranthene	10 ug/l	ND	ND	ND

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SAMPLE ANALYSIS REPORT

For FRED C. HART ASSOC. INC.
530 FIFTH AVENUE
212-840-3990
NEW YORK NY 10036
Attention: ROBERT GOLDMAN

Report Date: 03/31/88

Job No.: 86GW3538
Date Received: 11/03/86
Units: ug/l

TEST PERFORMED: Base Neutral Extracts - Aqueous - Method 625

	COMPOUND	DET LMTS	025	026	027
86-73-7	Fluorene	10 ug/l	ND	ND	ND
118-74-1	Hexachlorobenzene	10 ug/l	ND	ND	ND
87-68-3	Hexachlorobutadiene	10 ug/l	ND	ND	ND
77-47-4	Hexachlorocyclo-pentadiene	10 ug/l	ND	ND	ND
67-72-1	Hexachloroethane	10 ug/l	ND	ND	ND
193-39-5	Indeno (1,2,3-cd) pyrene	10 ug/l	ND	ND	ND
78-59-1	Isophorone	10 ug/l	ND	ND	ND
91-20-31	Naphthalene	10 ug/l	ND	ND	ND
98-95-3	Nitrobenzene	10 ug/l	ND	ND	ND
62-75-9	N-nitrosodimethyl-amine	10 ug/l	ND	ND	ND
621-64-7	N-nitrosodi-n-propylamine	10 ug/l	ND	ND	ND
86-30-6	N-nitrosodiphenyl-amine	10 ug/l	ND	ND	ND
85-01-8	Phenanthrene	10 ug/l	ND	ND	ND
129-00-0	Pyrene	10 ug/l	ND	ND	ND
120-82-1	1,2,4-Trichloro-benzene	10 ug/l	ND	ND	ND
...					
...					
SURROGATE RECOVERY DATA					
	% RECOVERY				
...					
...					
2-Fluorophenol			91	117	95
D5-Phenol			69	67	57
D5-Nitrobenzene			36	29	34
2-Fluorobiphenyl			41	36	41
2,4,6-Tribromophenol			310	164	151
...					
DATE ANALYZED:			11/11/86	11/12/86	11/11/86
SAMPLE MULTIPLIER:			1	1	1

...

To obtain MDL for each sample, multiply "Sample Multiplier" times detection limit for each parameter.

APPENDIX H.4

TOTAL PETROLEUM HYDROCARBON ANALYSIS RESULTS FOR WATER SAMPLES

(CL5060B/0528N)

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PETROLEUM HYDROCARBONS ANALYSES REPORT

MAFB AQUEOUS SAMPLES

HART INDENTIFIER	PTL INDENTIFIER	JOB REFERENCE #	DATE OF REPORT	RESULTS mg/l
DW-2	SN001	86GW3523	11-26-86	<0.5
DW-1	SN003	86GW3523	11-26-86	<0.5
SW-3	SN004	86GW3506	12-2-86	<0.5
SW-4	SN005	86GW3506	12-2-86	<0.5
SW-5	SN006	86GW3506	12-2-86	<0.5
SW-6	SN007	86GW3523	11-26-86	<0.5
SW-8	SN008	86GW3523	11-26-86	<0.5
SW-9 GW-1	SN009	86GW3506	12-2-86	0.5
SW-9 GW-2	SN010	86GW3506	12-2-86	<0.5
SW-1	SN012	86GW3506	12-2-86	<0.5
FTA FB HART 011	SN011	86GW3506	12-2-86	<1.0 *
DW-3	SN013	86GW3523	11-26-86	<2.0 *
DW-4	SN014	86GW3523	11-26-88	<0.5
SLA FB HART 015	SN015	86GW3506	12-2-86	<0.5
MW-1	SN017	86GW3523	11-26-86	<0.5
MW-2	SN018	86GW3523	11-26-86	<0.5
MW-3	SN019	86GW3523	11-26-86	<0.5
MW-4	SN020	86GW3523	11-26-86	<4.0 *
DW-5	SN021	86GW3523	11-26-86	0.8
COE	SN022	86GW3523	11-26-86	1.1
SWA	SN023	86GW3538	11-25-86	<0.5
SWB	SN024	86GW3538	11-25-86	<0.5
SWC	SN025	86GW3538	11-25-86	<0.5
SWD	SN026	86GW3538	11-25-86	<0.5
SWE	SN027	86GW3538	11-25-86	<0.5

MDL ------ 0.5 mg/l

* HIGHER DETECTION LIMITS DUE TO THE LESSER VOLUME OF SAMPLE SUBMITTED

APPENDIX H.5

TOTAL PETROLEUM HYDROCARBON ANALYSIS RESULTS FOR SOIL AND SEDIMENT SAMPLES

(CL5060B/0528N)

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PETROLEUM HYDROCARBONS ANALYSES REPORT

MAFB SOLID SAMPLES

HART INDENTIFIER	PTL INDENTIFIER	JOB REFERENCE #	DATE OF REPORT	RESULTS mg/kg
001	001	86GW3440	12-8-86	440
002	002	86GW3440	12-8-86	780
003	003	86GW3440	12-8-86	290
004	004	86GW3440	12-8-86	13
005	005	86GW3440	12-8-86	10,750
006	006	86GW3440	12-8-86	16,550
007	007	86GW3440	12-8-86	350
008	008	86GW3440	12-8-86	3230
009	009	86W3441	11-26-86	<10.0
010	010	86W3441	11-26-86	<10.0
011	011	86W3441	11-26-86	<10.0

MDL ----- 10.0 mg/kg

APPENDIX H.6

PRIORITY POLLUTANT METALS
ANALYSES RESULTS FOR WATER SAMPLES

(CL5060B/0528N)

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PRIORITY POLLUTANT METALS ANALYSES REPORT

MAFB AQUEOUS SAMPLES

HART INDENTIFIER		DW-2	DW-1	SW-3	SW-4
PTL INDENTIFIER		SN 001	SN003	SN004	SN005
JOB REFERENCE #		86GW3523	86GW3523	86GW3506	86GW3506
DATE OF REPORT		11-26-86	11-26-86	12-2-86	12-2-86
	MDL		mg/l		
BERYLLIUM	0.05	<0.05	<0.05	<0.05	<0.05
CADMIUM	0.005	<0.005	<0.005	<0.005	<0.005
CHROMIUM	0.02	<0.02	<0.02	<0.02	<0.02
COPPER	0.02	0.03	<0.02	0.08	0.13
NICKEL	0.01	0.018	<0.010	0.14	0.15
LEAD	0.02	0.15	<0.02	<0.02	<0.02
ZINC	0.02	0.04	0.03	0.27	0.46
ARSENIC	0.01	<0.01	<0.01	<0.01	<0.01
SILVER	0.01	<0.01	<0.01	0.01	0.01
ANTIMONY	0.10	<0.1	<0.10	<0.10	<0.10
SELENIUM	0.01	<0.01	<0.01	<0.01	<0.01
THALLIUM	0.01	<0.010	<0.010	<0.010	<0.010
MERCURY	0.001	<0.001	<0.001	<0.001	<0.001

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PRIORITY POLLUTANTS METALS ANALYSES REPORT

MAFB AQUEOUS SAMPLES

HART INDENTIFIER		SW-5	SW-6	SW-8	SW-9 GW-1
PTL INDENTIFIER		SN006	SN007	SN008	SN009
JOB REFERENCE #		86GW3506	86GW3523	86GW3523	86GW3506
DATE OF REPORT		12-2-86	11-26-86	11-26-86	12-2-86
	MDL		mg/l		
BERYLLIUM	0.05	<0.05	<0.05	---	---
CADMIUM	0.005	<0.005	<0.005	---	---
CHROMIUM	0.02	<0.02	<0.02	---	---
COPPER	0.02	0.03	0.03	---	---
NICKEL	0.01	<0.010	<0.010	---	---
LEAD	0.02	0.02	<0.02	<0.02	<0.02
ZINC	0.02	0.09	0.06	---	---
ARSENIC	0.01	<0.01	<0.01	---	---
SILVER	0.01	0.02	<0.01	---	---
ANTIMONY	0.10	<0.10	<0.10	---	---
SELENIUM	0.01	<0.01	<0.01	---	---
THALLIUM	0.01	<0.010	<0.010	---	---
MERCURY	0.001	<0.001	<0.001	---	---

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PRIORITY POLLUTANT METALS ANALYSES

MAFB AQUEOUS SAMPLES

HART INDENTIFIER		SW-9 GW-9	SW-1	ETA FIELD BLANK	DW-3
PTL INDENTIFIER		SN010	SN012	SN011	SN013
JOB REFERENCE #		86GW3506	86GW3506	86GW3506	86GW3523
DATE OF REPORT		12-2-86	12-2-86	12-2-86	12-2-86
	MDL		mg/l		
BERYLLIUM	0.05	---	<0.05	---	<0.05
CADMIUM	0.005	---	<0.005	---	<0.005
CHROMIUM	0.02	---	<0.02	---	<0.02
COPPER	0.02	---	0.04	---	0.07
NICKEL	0.01	---	0.06	---	0.018
LEAD	0.02	<0.02	<0.02	<0.02	<0.02
ZINC	0.02	---	0.15	---	0.13
ARSENIC	0.01	---	<0.01	---	<0.01
SILVER	0.01	---	<0.01	---	<0.01
ANTIMONY	0.10	---	<0.10	---	<0.10
SELENIUM	0.01	---	<0.01	---	<0.01
THALLIUM	0.01	---	<0.010	---	<0.010
MERCURY	0.001	---	<0.001	---	<0.001

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PRIORITY POLLUTANT METALS ANALYSES

MAFB AQUEOUS SAMPLES

HART INDENTIFIER		DW-4	SLA FIELD BLANK	MW-1	MW-2
PTL INDENTIFIER		SN014	SN015	SN017	SN018
JOB REFERENCE #		86GW3523	86GW3506	86GW3523	86GW3523
DATE OF REPORT		11-26-88	12-2-86	11-26-88	11-26-88
	MDL		mg/l		
BERYLLIUM	0.05	<0.05	<0.05	<0.05	<0.05
CADMIUM	0.005	<0.005	<0.005	<0.005	<0.005
CHROMIUM	0.02	<0.02	<0.02	<0.02	<0.02
COPPER	0.02	<0.02	<0.02	<0.02	<0.02
NICKEL	0.01	<0.010	0.014	0.011	0.020
LEAD	0.02	<0.02	<0.02	<0.02	<0.02
ZINC	0.02	0.07	<0.02	0.03	0.04
ARSENIC	0.01	<0.01	<0.01	<0.01	<0.01
SILVER	0.01	<0.01	<0.01	<0.01	<0.01
ANTIMONY	0.10	<0.10	<0.10	<0.10	<0.10
SELENIUM	0.01	<0.01	<0.01	<0.01	<0.01
THALLIUM	0.01	<0.010	<0.010	<0.010	<0.010
MERCURY	0.001	<0.001	<0.001	<0.001	<0.001

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PRIORITY POLLUTANTS METALS ANALYSES REPORT

MAFB AQUEOUS SAMPLES

HART INDENTIFIER		MW-3	MW-4	DW-5	COE
PTL INDENTIFIER		SN019	SN020	SN021	SN022
JOB REFERENCE #		86GW3523	86GW3523	86GW3523	86GW3523
DATE OF REPORT		11-26-86	11-26-86	11-26-86	11-26-86
	MDL		mg/l		
BERYLLIUM	0.05	<0.05	<0.05	<0.05	<0.05
CADMIUM	0.005	<0.005	<0.005	<0.005	<0.005
CHROMIUM	0.02	<0.02	<0.02	<0.02	<0.02
COPPER	0.02	<0.02	0.59	<0.02	<0.02
NICKEL	0.01	<0.010	0.43	<0.010	0.016
LEAD	0.02	<0.02	0.17	<0.02	2.47
ZINC	0.02	0.02	1.67	0.03	21.7
ARSENIC	0.01	<0.01	<0.01	<0.01	<0.01
SILVER	0.01	<0.01	0.01	<0.01	<0.01
ANTIMONY	0.10	<0.10	<0.10	<0.10	<0.10
SELENIUM	0.01	<0.01	<0.01	<0.01	<0.01
THALLIUM	0.01	<0.010	<0.010	<0.010	<0.010
MERCURY	0.001	<0.001	<0.001	<0.001	<0.001

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PRIORITY POLLUTANT METALS ANALYSES REPORT

MAFB AQUEOUS SAMPLES

HART INDENTIFIER		SWA	SWB	SWC	SWD
PTL IDENTIFIER		SN023	SN024	SN025	SN026
JOB REFERENCE #		86GW3538	86GW3538	86GW3538	86GW3538
DATE OF REPORT		11-25-86	11-25-86	11-25-86	11-25-86
	MDL		mg/l		
BERYLLIUM	0.05	<0.05	<0.05	<0.05	<0.05
CADMIUM	0.005	<0.005	<0.005	<0.005	<0.005
CHROMIUM	0.02	<0.02	<0.02	<0.02	<0.02
COPPER	0.02	0.03	<0.02	0.04	0.03
NICKEL	0.01	0.016	0.097	0.085	<0.010
LEAD	0.02	<0.02	<0.02	<0.02	<0.02
ZINC	0.02	0.03	0.04	0.06	0.06
ARSENIC	0.01	<0.01	<0.01	<0.01	<0.01
SILVER	0.01	<0.01	<0.01	<0.01	<0.01
ANTIMONY	0.10	<0.10	<0.10	<0.10	<0.10
SELENIUM	0.01	<0.01	<0.01	<0.01	<0.01
THALLIUM	0.01	<0.010	<0.010	<0.010	<0.010
MERCURY	0.001	<0.001	<0.001	<0.001	<0.001

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PRIORITY POLLUTANT METALS ANALYSES REPORT

MAFB AQUEOUS SAMPLES

HART INDENTIFIER		SWE
PTL INDENTIFIER		SN027
JOB REFERENCE #		86GW3538
DATE OF REPORT		11-25-86
	MDL	mg/l
BERYLLIUM	0.05	<0.05
CADMIUM	0.005	<0.005
CHROMIUM	0.02	<0.02
COPPER	0.02	0.04
NICKEL	0.01	0.014
LEAD	0.02	<0.02
ZINC	0.02	0.22
ARSENIC	0.01	<0.01
SILVER	0.01	<0.01
ANTIMONY	0.10	<0.10
SELENIUM	0.01	<0.01
THALLIUM	0.01	<0.010
MERCURY	0.001	<0.001

APPENDIX H.7

PRIORITY POLLUTANT METALS ANALYSES
RESULTS FOR SOIL AND SEDIMENT SAMPLES

(CL5060B/0528N)

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Princeton, NJ 08543-3108
(609) 452-9050

PRIORITY POLLUTANT METALS ANALYSES REPORT

MAFB SOLID SAMPLES

HART INDENTIFIER	PTL INDENTIFIER	JOB REFERENCE #	DATE OF RESULTS	RESULTS LEAD, mg/kg
ART 001	001	86GW3440	12-8-86	4.28
ART 001	002	86GW3440	12-8-86	2.88
ART 003	003	86GW3440	12-8-86	2.34
ART 004	004	86GW3440	12-8-86	2.58
ART 005	005	86GW3440	12-8-86	8.03
ART 006	006	86GW3440	12-8-86	12.2
ART 007	007	86GW3440	12-8-86	3.85
ART 008	008	86GW3440	12-8-86	1.33

MDL ------- 1.0 mg/kg

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PRIORITY POLLUTANT METALS ANALYSES REPORT

MAFB SOLID SAMPLES

HART INDENTIFIER	HART 009	HART 010	HART 011
PTL INDENTIFIER	PTL - 009	PTL - 010	PTL - 011
JOB REFERENCE #	86GW3441	86GW3441	86GW3441
DATE OF REPORT	1-6-88	1-6-88	1-6-88

	MDL	mg/kg		
BERYLLIUM	2.5	<2.50	<2.50	<2.50
CADMIUM	0.5	0.85	<0.50	1.73
CHROMIUM	1.0	1.53	1.39	1.46
COPPER	1.0	13.1	12.8	12.7
NICKEL	2.0	12.4	10.3	11.5
LEAD	2.0	11.5	5.03	3.93
ZINC	0.5	47.6	60.1	59.1
ARSENIC	0.5	<0.50	<0.50	<0.50
SILVER	0.5	1.85	1.43	0.58
ANTIMONY	10.0	<10.0	<10.0	<10.0
SELENIUM	0.5	<0.50	<0.50	<0.50
THALLIUM	5.0	<5.0	<5.0	<5.0
MERCURY	0.10	<0.10	<0.10	<0.10

APPENDIX H.8

COMMON ANION AND TOTAL DISSOLVED SOLIDS ANALYSES RESULTS FOR WATER SAMPLES

(CL5060B/0528N)

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COMMON ANIONS AND TDS ANALYSES REPORT

MAFB AQUEOUS SAMPLE

HART IDENTIFIER	DW-2	DW-1	SW-3	SW-4
PTL IDENTIFIER	SN001	SN003	SN004	SN005
JOB REFERENCE #	86GW3523	86GW3523	86GW3506	86GW3506
DATE OF REPORT	11-26-86	11-26-86	12-2-86	12-2-86

	MDL	mg/l			
CHLORIDE	1.0	10	10	130	60
FLUORIDE	0.1	0.61	0.64	1.02	1.04
BROMIDE	0.1	0.25	0.90	3.2	1.8
NITRATE NITROGEN	0.1	<0.1	<0.1	<0.1	0.24
NITRITE NITROGEN	0.01	<0.01	<0.01	<0.01	<0.01
ORTHO PHOSPHATE	0.1	0.12	0.15	4.2	3.5
SULFATE	1.0	700	800	6300	5600
TOTAL DISSOLVED SOLIDS	2.0	1280	1621	6490	5904

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COMMON ANIONS AND TDS ANALYSES REPORT

MAFB AQUEOUS SAMPLE

HART INDENTIFIER		SW-5	SW-6	SW-1
PTL INDENTIFIER		SN006	SN007	SN012
JOB REFERENCE #		86GW3506	86GW3523	86GW3506
DATE OF REPORT		12-2-86	11-26-86	12-2-86
	MDL		mg/l	
CHLORIDE	1.0	50	120	150
FLUORIDE	0.1	1.2	1.2	0.38
BROMIDE	0.1	3.4	3.9	4.3
NITRATE NITROGEN	0.1	2.2	0.63	0.15
NITRITE NITROGEN	0.01	<0.01	<0.01	<0.1
ORTHO PHOSPHATE	0.1	0.85	<0.10	2.0
SULFATE	1.0	3870	5000	1260
TOTAL DISSOLVED SOLIDS	2.0	9440	5944	2222

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COMMON ANIONS AND TDS ANALYSES REPORT

MAFB AQUEOUS SAMPLE

HART IDENTIFIER		DW-3	DW-4	SLA FIELD BLANK	MW-1
PTL IDENTIFIER		SN013	SN014	SN015	SN017
JOB REFERENCE #		86GW3523	86GW3523	86GW3506	86GW3523
DATE OF REPORT		11-26-86	11-26-86	12-2-86	11-26-86
	MDL		mg/l		
CHLORIDE	1.0	30	30	0	30
FLUORIDE	0.1	0.76	0.99	<0.1	0.48
BROMIDE	0.1	1.4	<0.1	<0.1	1.5
NITRATE NITROGEN	0.1	<0.1	<0.1	<0.1	<0.1
NITRITE NITROGEN	0.01	<0.01	<0.01	0.04	<0.01
ORTHO PHOSPHATE	0.1	0.9	0.18	<0.10	0.14
SULFATE	1.0	1700	4500	<1.0	800
TOTAL DISSOLVED SOLIDS	2.0	2798	5036	1.0	1907

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COMMON ANIONS AND TDS ANALYSES REPORT

MAFB AQUEOUS SAMPLE

HART IDENTIFIER		MW-2	MW-3	MW-4	DW-5
PTL INDENTIFIER		SN018	SN019	SN020	SN021
JOB REFERENCE #		86GW3523	86GW3523	86GW3523	86GW352
DATE OF REPORT		11-26-86	11-26-86	11-26-86	11-26-86
	MDL		mg/l		
CHLORIDE	1.0	60	80	60	35
FLUORIDE	0.1	0.87	0.69	0.85	0.87
BROMIDE	0.1	2.1	2.8	<0.1	0.90
NITRATE NITROGEN	0.1	<0.1	0.11	<0.1	0.13
NITRITE NITROGEN	0.01	<0.01	<0.01	<0.01	<0.01
ORTHO PHOSPHATE	0.1	0.15	0.19	19.2	0.14
SULFATE	1.0	2550	1518	1900	4800
TOTAL DISSOLVED SOLIDS	2.0	3316	1900	1996	4848

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COMMON ANIONS AND TDS ANALYSES REPORT

MAFB AQUEOUS SAMPLE

HART IDENTIFIER		SWA	SWB	SWC	SWD
PTL IDENTIFIER		SN023	SN024	SN025	SN026
JOB REFERENCE #		86GW3538	86GW3538	86GW3538	86GW3538
DATE OF REPORT		11-25-86	11-25-86	11-25-86	11-25-86
	MDL		mg/l		
CHLORIDE	1.0	400	120	180	50
FLUORIDE	0.1	1.5	1.3	1.6	1.5
BROMIDE	0.1	2.8	311	2.7	1.8
NITRATE NITROGEN	0.1	0.25	0.24	0.25	0.21
NITRITE NITROGEN	0.001	0.08	<0.01	<0.01	<0.01
ORTHO PHOSPHATE	0.1	0.10	0.96	<0.10	<0.10
SULFATE	1.0	2400	1100	3300	3300
TOTAL DISSOLVED SOLIDS	2.0	4460	2596	4782	3878

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COMMON ANIONS AND TDS ANALYSES REPORT

MAFB AQUEOUS SAMPLE

HART IDENTIFIER		SWE	COE
PTL INDENTIFIER		SN027	SN022
JOB REFERENCE #		86GW3538	86GW3523
DATE OF REPORT		11-25-86	11-25-86
	MDL	mg/l	
CHLORIDE	1.0	380	490
FLUORIDE	0.1	1.5	0.40
BROMIDE	0.1	6.8	<0.1
NITRATE NITROGEN	0.1	1.05	<0.1
NITRITE NITROGEN	0.01	0.10	0.05
ORTHO PHOSPHATE	0.1	0.22	0.9
SULFATE	1.0	2400	<1.0
TOTAL DISSOLVED SOLIDS	2.0	4761	2120

APPENDIX H.9

PTL QC DATA

(CL5060B/0528N)

APPENDIX H.9.a

LABORATORY METHODOLOGY SUMMARY

(CL5060B/0528N)

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METHODOLOGY SUMMARY

AQUEOUS SAMPLES

METAL ANALYSES - EPA 600/4-79-020

BERYLLIUM	210.1	ARSENIC	206.2
CADMIUM	213.1	SILVER	272.1
CHROMIUM	218.1	ANTIMONY	204.1
COPPER	220.1	SELENIUM	270.2
NICKEL	249.1	THALLIUM	279.1
LEAD	239.1	MERCURY	245.1
ZINC	289.1		

COMMON ANIONS - EPA 600/4-79-020
SM -16th-EDITION, 1985

CHLORIDE	SM 407 A
FLUORIDE	EPA 340.1
BROMIDE	SM 405
NITRATE NITROGEN	EPA 352.1
NITRITE NITROGEN	SM 419
PHOSPHATE	EPA 365.2
SULFATE	EPA 375.4

TOTAL DISSOLVED SOLIDS EPA 160.1

TOTAL PETROLEUM HYDROCARBON EPA 418.1

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METHODOLOGY SUMMARY

SOIL SAMPLES

METAL ANALYSES - SOLID WASTE METHOD/SW-846

BERYLLIUM	7090
CADMIUM	7130
CHROMIUM	7190
COPPER	7210
NICKEL	7520
LEAD	7420
ZINC	7950
ARSENIC	7060
SILVER	7760
ANTIMONY	7040
SELENIUM	7740
THALLIUM	7840
MERCURY	7470

TOTAL PETROLEUM HYDROCARBON - SOXHLET EXTRACTION
EPA METHOD 418.1

APPENDIX H.9.b

PRIORITY POLLUTANT METALS,
COMMON ANIONS AND TOTAL DISSOLVED
SOLIDS DUPLICATE AND MATRIX
SPIKE ANALYSES RESULTS FOR
WATER SAMPLES

(CL5060B/0528N)

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QUALITY CONTROL DATA

I. PRIORITY POLLUTANT METALS

	DUP I.	DUP II.	SPIKE SOLUTION ADDED	SPIKED SAMPLE	% RECOVERY
			mg/l		
BERYLLIUM					
3506/006	<0.05	<0.05	0.150	0.132	88
3523/007	<0.05	<0.05	0.150	0.129	86
CADMIUM					
3506/006	<0.005	<0.005	0.150	0.159	106
3523/007	<0.005	<0.005	0.150	0.157	105
3538/027	<0.005	<0.005	0.150	0.153	102
CHROMIUM					
3506/006	<0.02	<0.02	0.150	0.153	102
3523/007	<0.02	<0.02	0.150	0.154	103
COPPER					
3506/006	0.03	0.03	0.150	0.179	99
3523/007	0.03	0.03	0.150	0.182	101
3538/027	0.04	0.04	0.150	0.204	109
NICKEL					
3506/006	<0.01	<0.01	0.150	0.149	99
3523/007	<0.01	<0.01	0.150	0.148	99
3538/027	0.013	0.014	0.150	0.147	89

Note: Quality control (duplicate and matrix spike) analyses are performed in conjunction with routine sample analyses; refer to Appendix H.9.d for dates of inorganic analyses of samples.

H.9.b.-2

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	DUP I.	DUP II.	SPIKE SOLUTION ADDED	SPIKED SAMPLE	%RECOVERY
LEAD					
3440/003, mg/kg	2.23	2.25	120	119.5	98
3506/006	0.025	0.026	0.150	0.152	84
3523/007	<0.02	<0.02	0.150	0.152	101
3538/027	<0.02	<0.02	0.150	0.148	99
ZINC					
3506/006	0.087	0.088	0.150	0.254	111
3523/007	0.058	0.061	0.150	0.214	103
3538/027	0.24	0.185	0.150	0.349	86
ARSENIC					
3523/014	<0.01	<0.01	0.20	0.172	86
3538/024	<0.01	<0.01	0.20	0.186	93
SILVER					
3506/006	0.02	0.02	0.150	0.153	89
3523/007	<0.01	<0.01	0.150	0.129	86
3538/027	<0.01	<0.01	0.150	0.131	87
SELENIUM					
3523/014	<0.01	<0.01	0.20	0.188	94
3538/024	<0.01	<0.01	0.20	0.174	87
THALLIUM					
3506/006	<0.010	<0.010	0.15	0.139	93
3523/007	<0.010	<0.010	0.15	0.134	89
MERCURY					
3506/005	<0.001	<0.001	0.005	0.0048	96
3523/014	<0.001	<0.001	0.005	0.0046	92
3538/026	<0.001	<0.001	0.005	0.0052	104

Note: Quality control (duplicate and matrix spike) analyses are performed in conjunction with routine sample analyses; refer to Appendix H.9.d for dates of inorganic analyses of samples.

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	DUP I.	DUP II.	SPIKE SOLUTION ADDED	SPIKED SAMPLE	%RECOVERY
II. COMMON ANIONS					
CHLORIDE					
3506/005	58	62	---	---	---
3503/021	35	35	---	---	--
FLUORIDE					
3523/008	0.87	0.82	0.40	1.20	88
3538/026	1.5	1.5	0.40	1.86	90
BROMIDE					
3523/001	<0.10	0.50	2.0	2.1	93
3538/025	2.4	3.0	2.0	4.3	80
NITRATE NITROGEN					
3506/015	<0.10	<0.10	0.20	0.225	112
3523/020	<0.10	<0.10	0.20	0.20	100
3538/027	1.27	0.83	0.20	1.22	90
NITRITE NITROGEN					
3523/008	<0.01	<0.01	0.04	0.038	95
3506/015	<0.01	<0.01	0.04	0.036	90
PHOSPATE					
3523/018	0.14	0.15	0.50	0.63	96
3538/026	<0.10	<0.10	<0.50	0.52	104
SULFATE					
3523/008	1650	1700	1000	2850	117
3538/026	3650	3300	1000	4500	100

Note: Quality control (duplicate and matrix spike) analyses are performed in conjunction with routine sample analyses; refer to Appendix H.9.d for dates of inorganic analyses of samples.

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	DUP I.	DUP II.	SPIKE SOLUTION ADDED	SPIKED SAMPLE	%RECOVERY
III. TOTAL DISSOVLED SOLIDS					
3523/017	1896	1918	---	---	---
3538/024	2625	2567	---	---	---

IV. PETROLEUM HYDROCARBON

DUPLICATE ANALYSIS WAS NOT DONE DUE TO INSUFFICIENT SAMPLE VOLUME PROVIDED.

Note: Quality control (duplicate and matrix spike) analyses are performed in conjunction with routine sample analyses; refer to Appendix H.9.d for dates of inorganic analyses of samples.

APPENDIX H.9.c

HALOGENATED VOLATILE ORGANIC
DUPLICATE AND MATRIX SPIKE
ANALYSES RESULTS FOR
WATER SAMPLES

(CL5060B/0528N)

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QUALITY CONTROL REPORT

Matrix Spike Analysis

JOB NO: BCGW3538
ANALYST: M R DAVE
DATE: 11/19/86
MATRIX: PE/mcw
METHOD: EPA 601/602

Micrograms per liter (~~Milligrams per Kilogram~~) Light

COMPOUND		CONCENTRATION (~~Milligrams per Kilogram~~) Light		%
Sample ID	SURROGATE NAME	Spiked Sample Result (SSR)	Spike Added (SA)	Recovery
MAFB, SWD SI-MART 026	Bromodichlorosomethane	345	340	101.2

H.9.c.-1

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QUALITY CONTROL REPORT

Matrix Spike Analysis

JOB NO. 86GW3538
ANALYST: M R. DAVE
DATE: 11/19/86
MATRIX: PE/mw
METHOD: EPA 601/602

COMPOUND		ug/l Q		ug/l	
Sample ID	COMPOUND NAME	Sample Result (SR)	Spiked Sample Result (SSR)	Spike Added (SA)	% Recovery*
023	Trichlorofluoromethane	0	51.4	50	102.8
	1,2-Dichloroethane	0	50.75	50	101.5
	Bromodichloromethane	0	51.625	50	103.25
	Tetrachloroethene	0	52.5	50	105.0

*% Recovery = $\frac{(SSR - SR)}{(SA)}$ X 100

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QUALITY CONTROL REPORT

Duplicate Analysis

JOB NO. JN 86 GW 3506
ANALYST: M R DAVE
DATE: 11/19/86
MATRIX: PE/INW
METHOD: EPA 601/602

COMPOUND		CONCENTRATION (ug/1)		Relative Percent Difference (RPD)*
Sample ID	COMPOUND NAME	Run 1 (D_1)	Run 2 (D_2)	
MW8, SW-4, GW-2, HAN 010	1,2- DICHLOROETHANE	11	10	9.5
	1,1,1 - TRICHLOROETHANE	11	11	0
	BROMODICHLOROMETHANE	3	3	0
	TRICHLOROETHENE	4	4	0
	TETRACHLOROETHENE	2	2	0

H.9.c.-3

$$*RPD = \frac{(D_1 - D_2)}{\left[\frac{(D_1 + D_2)}{2}\right]} \times 100$$

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QUALITY CONTROL REPORT

Duplicate Analysis

JOB NO. 86GW3538
ANALYST: MR·DAVE
DATE: 11/19/86
MATRIX: PE/mw
METHOD: EPA 601/602

COMPOUND		CONCENTRATION (ug/1)		Relative Percent Difference (RPD)*
Sample ID	COMPOUND NAME	Run 1 (D_1)	Run 2 (D_2)	
MAFB, SWB, SI-HART 024	Methylene Chloride	0	0	0
	trans-1,2-dichloroethene	0	0	0
	Chloroform	0	0	0
	1,1,1- Trichloroethane	0	0	0

$$*RPD = \frac{(D_1 - D_2)}{\left[\frac{(D_1 + D_2)}{2}\right]} \times 100$$

H.9.c.-4

APPENDIX H.9.d

LABORATORY CHRONICLES

(CL5060B/0528N)

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Associates

JOB NO. 86GW3523

TYPE SAMPLES: Water

DUE DATE: _____

NUMBER: 13

DATE RECEIVED & REFRIGERATED: 10/31/86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES	11/5/86
2. BASE/NEUTRALS *	11/5/86
3. PESTICIDES/PCBs	__/__/__
4. MISCELLANEOUS	__/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	11/20/86

ANALYSES INFORMATION

1. VOLATILES	
(a) 601/602	11/12/86
(b) 624	__/__/__
2. ACID EXTRACTABLES*	11/12/86
3. BASE/NEUTRALS *	11/11/86
4. PESTICIDES/PCBs	__/__/__
5. MISCELLANEOUS	__/__/__

INORGANICS

1. METALS	__/__/__
2. CYANIDES	__/__/__
3. PHENOL	__/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	__/__/__

OTHER ANALYTES

_____

_____

_____

_____

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: _____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both.

* Base Neutrals/Acid Extracts - Method 625

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Associates

JOB NO. 86GW3538

TYPE SAMPLES: Water

DUE DATE: _____

NUMBER: 5

DATE RECEIVED & REFRIGERATED: 11/3/86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES	____	11/6/86
2. BASE/NEUTRALS	____	11/6/86
3. PESTICIDES/PCBs	____	__/__/__
4. MISCELLANEOUS	____	__/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	____	11/20/86

ANALYSES INFORMATION

1. VOLATILES (a) 601/602	____	11/13/86
(b) 624	____	__/__/__
2. ACID EXTRACTABLES	____	11/11/86
3. BASE/NEUTRALS	____	11/11/86
4. PESTICIDES/PCBs	____	__/__/__
5. MISCELLANEOUS	____	__/__/__

INORGANICS

1. METALS	____	__/__/__
2. CYANIDES	____	__/__/__
3. PHENOL	____	__/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	____	__/__/__

OTHER ANALYTES

_____

_____

_____

_____

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: _____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both.

REVISED 2/24/86

H.9.d.-3

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Associates

JOB NO. 86GW3506

TYPE SAMPLES: Water

DUE DATE: ____

NUMBER: 9

DATE RECEIVED & REFRIGERATED: 10/30/86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES	11/11/86
2. BASE/NEUTRALS	11/11/86
3. PESTICIDES/PCBs	NA
4. MISCELLANEOUS	NA
DIVISION SUPERVISOR REVIEW & APPROVAL:	11/20/86

ANALYSES INFORMATION

1. VOLATILES	
(a) 601/602	11/10/86
(b) 624	__/__/__
2. ACID EXTRACTABLES	11/12/86
3. BASE/NEUTRALS	11/12/86
4. PESTICIDES/PCBs	__/__/__
5. MISCELLANEOUS	__/__/__

INORGANICS

1. METALS	__/__/__
2. CYANIDES	__/__/__
3. PHENOL	__/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	__/__/__

OTHER ANALYTES

____

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____

____

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: ____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both.

REVISED 2/24/86

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Assoc.

JOB NO. 86GW3538

TYPE SAMPLES: Water

DUE DATE: _____

NUMBER: Five (5)

DATE RECEIVED & REFRIGERATED: 11-3-86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES ____ __/__/__
2. BASE/NEUTRALS ____ __/__/__
3. PESTICIDES/PCBs ____ __/__/__
4. MISCELLANEOUS ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: ____ __/__/__

ANALYSES INFORMATION

1. VOLATILES
   (a) 601/602 ____ __/__/__
   (b) 624 ____ __/__/__
2. ACID EXTRACTABLES ____ __/__/__
3. BASE/NEUTRALS ____ __/__/__
4. PESTICIDES/PCBs ____ __/__/__
5. MISCELLANEOUS ____ __/__/__

INORGANICS

1. METALS 11/4 - 11/6/86
2. CYANIDES ____ __/__/__
3. PHENOL ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: JCS 4/1/88

OTHER ANALYTES

Digestion - 11-3-86

Arsenic and Selenium 11/4 - 11-6-86

Mercury - 11-7-86

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: _____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both.

Total Petroleum Hydrocarbons	11-20-86	Bromide	11-21-86
Total Dissolved Solids	11-5-86	Chloride	11-4-86
pH		Sulfate	11-20-86
Nitrate Nitrogen	11-3-86	Fluoride	11-19-86
Nitrite Nitrogen	11-4-86	Total Phosphate as P	11-21-86

REVISED 2/24/86

H.9.d.-5

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. HArt Associates

JOB NO. 86GW3440

TYPE SAMPLES: Soil

DUE DATE: ____

NUMBER: 9

DATE RECEIVED & REFRIGERATED: 10/27/86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES ____ __/__/__
2. BASE/NEUTRALS ____ __/__/__
3. PESTICIDES/PCBs ____ __/__/__
4. MISCELLANEOUS ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: ____ __/__/__

ANALYSES INFORMATION

1. VOLATILES
   (a) 8010/8020 ____ 12/01/86
   (b) 624 ____ __/__/__
2. ACID EXTRACTABLES ____ __/__/__
3. BASE/NEUTRALS ____ __/__/__
4. PESTICIDES/PCBs ____ __/__/__
5. MISCELLANEOUS ____ __/__/__

INORGANICS

1. METALS ____ __/__/__
2. CYANIDES ____ __/__/__
3. PHENOL ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: ____ __/__/__

OTHER ANALYTES

_____

_____

_____

_____

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: _____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Assoc

JOB NO. 86GW3440

TYPE SAMPLES: Soil

DUE DATE: _____

NUMBER: Eight (8)

DATE RECEIVED & REFRIGERATED: 10-27-88

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES ____ __/__/__
2. BASE/NEUTRALS ____ __/__/__
3. PESTICIDES/PCBs ____ __/__/__
4. MISCELLANEOUS ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: ____ __/__/__

ANALYSES INFORMATION

1. VOLATILES
   (a) 601/602 ____ __/__/__
   (b) 624 ____ __/__/__
2. ACID EXTRACTABLES ____ __/__/__
3. BASE/NEUTRALS ____ __/__/__
4. PESTICIDES/PCBs ____ __/__/__
5. MISCELLANEOUS ____ __/__/__

INORGANICS

1. METALS ____ __/__/__
2. CYANIDES ____ __/__/__
3. PHENOL ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: JCH 4/1/88

OTHER ANALYTES

Digestion - 10-28-86

Lead - 11-5-86

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: _____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both.

Total Petroleum Hydrocarbons	11-6-86	Bromide	
Total Dissolved Solids		Chloride	
pH		Sulfate	
Nitrate Nitrogen		Fluoride	
Nitrite Nitrogen		Total Phosphate as P	

REVISED 2/24/86

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Assoc.

JOB NO. 86GW3506

TYPE SAMPLES: Water

DUE DATE: ____

NUMBER: Eight (8)

DATE RECEIVED & REFRIGERATED: 10-30-86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES ____ __/__/__
2. BASE/NEUTRALS ____ __/__/__
3. PESTICIDES/PCBs ____ __/__/__
4. MISCELLANEOUS ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: ____ __/__/__

ANALYSES INFORMATION

1. VOLATILES
   (a) 601/602 ____ __/__/__
   (b) 624 ____ __/__/__
2. ACID EXTRACTABLES ____ __/__/__
3. BASE/NEUTRALS ____ __/__/__
4. PESTICIDES/PCBs ____ __/__/__
5. MISCELLANEOUS ____ __/__/__

INORGANICS

1. METALS 11/4 - 11/6/86
2. CYANIDES ____ __/__/__
3. PHENOL ____ __/__/__

DIVISION SUPERVISOR REVIEW & APPROVAL: [signature] 4/1/88

OTHER ANALYTES

Digestion - 10-31-86

Arsenic and Selenium 11/4 - 11-6-86

Mercury - 11-7-86

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: ____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both

Total Petroleum Hydrocarbons	11-18-86	Bromide	11-3-86
Total Dissolved Solids	10-31-86	Chloride	11-4-86
pH		Sulfate	11-20-86
Nitrate Nitrogen	10-30-86	Fluoride	11-19-86
Nitrite Nitrogen	10-30-86	Total Phosphate as P	11-19-86

REVISED 2/24/86

H.9.d.-8

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Assoc.

JOB NO. 86GW3523

TYPE SAMPLES: Water

DUE DATE: _____

NUMBER: Tweleve (12)

DATE RECEIVED & REFRIGERATED: 10-31-86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES	____ __/__/__
2. BASE/NEUTRALS	____ __/__/__
3. PESTICIDES/PCBs	____ __/__/__
4. MISCELLANEOUS	____ __/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	____ __/__/__

ANALYSES INFORMATION

1. VOLATILES	
(a) 601/602	____ __/__/__
(b) 624	____ __/__/__
2. ACID EXTRACTABLES	____ __/__/__
3. BASE/NEUTRALS	____ __/__/__
4. PESTICIDES/PCBs	____ __/__/__
5. MISCELLANEOUS	____ __/__/__

INORGANICS

1. METALS	11/5 - 11/6/86
2. CYANIDES	____ __/__/__
3. PHENOL	____ __/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	[signature] 4/1/88

OTHER ANALYTES

Digestion - 11-3-86

Arsenic and Selenium 11/5 - 11-6-86

Mercury - 11-7-86

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: _____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both.

Total Petroleum Hydrocarbons	11-18-86	Bromide	11-3-86
Total Dissolved Solids	10-31-86	Chloride	11-4-86
pH		Sulfate	11-20-86
Nitrate Nitrogen	10-31-86	Fluoride	11-19-86
Nitrite Nitrogen	10-31-86	Total Phosphate as P	11-19-86

REVISED 2/24/86

H.9.d.-9

PRINCETON TESTING LABORATORY

LABORATORY CHRONICLE

COMPANY: Fred C. Hart Assoc.

JOB NO. 86GW3441

TYPE SAMPLES: Soil

DUE DATE: _____

NUMBER: Three (3)

DATE RECEIVED & REFRIGERATED: 10-27-86

ORGANICS

EXTRACTION INFORMATION

1. ACID EXTRACTABLES	____ __/__/__
2. BASE/NEUTRALS	____ __/__/__
3. PESTICIDES/PCBs	____ __/__/__
4. MISCELLANEOUS	____ __/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	____ __/__/__

ANALYSES INFORMATION

1. VOLATILES	
(a) 601/602	____ __/__/__
(b) 624	____ __/__/__
2. ACID EXTRACTABLES	____ __/__/__
3. BASE/NEUTRALS	____ __/__/__
4. PESTICIDES/PCBs	____ __/__/__
5. MISCELLANEOUS	____ __/__/__

INORGANICS

1. METALS	11/4 - 11/ 6/86
2. CYANIDES	____ __/__/__
3. PHENOL	____ __/__/__
DIVISION SUPERVISOR REVIEW & APPROVAL:	[signature] 4/1/88

OTHER ANALYTES

Digestion - 10-28-86

Arsenic and Selenium 11/5 - 11-6-86

Merucry - 11-3-86

QUALITY CONTROL SUPERVISOR REVIEW & APPROVAL: _____

If fractions are re-extracted and re-analyzed because initial endeavors did not meet quality control acceptance criteria, include dates for both

Total Petroleum Hydrocarbons	11-19-86	Bromide	
Total Dissolved Solids		Chloride	
pH		Sulfate	
Nitrate Nitrogen		Fluoride	
Nitrite Nitrogen		Total Phosphate as P	

REVISED 2/24/86

APPENDIX H.10

J&L TESTING COMPANY RESULTS FOR GRAIN SIZE
ANALYSIS OF MAFB SUBSURFACE SOIL SAMPLES

(CL5060B/0528N)

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

PROJECT LOCATION MAFB

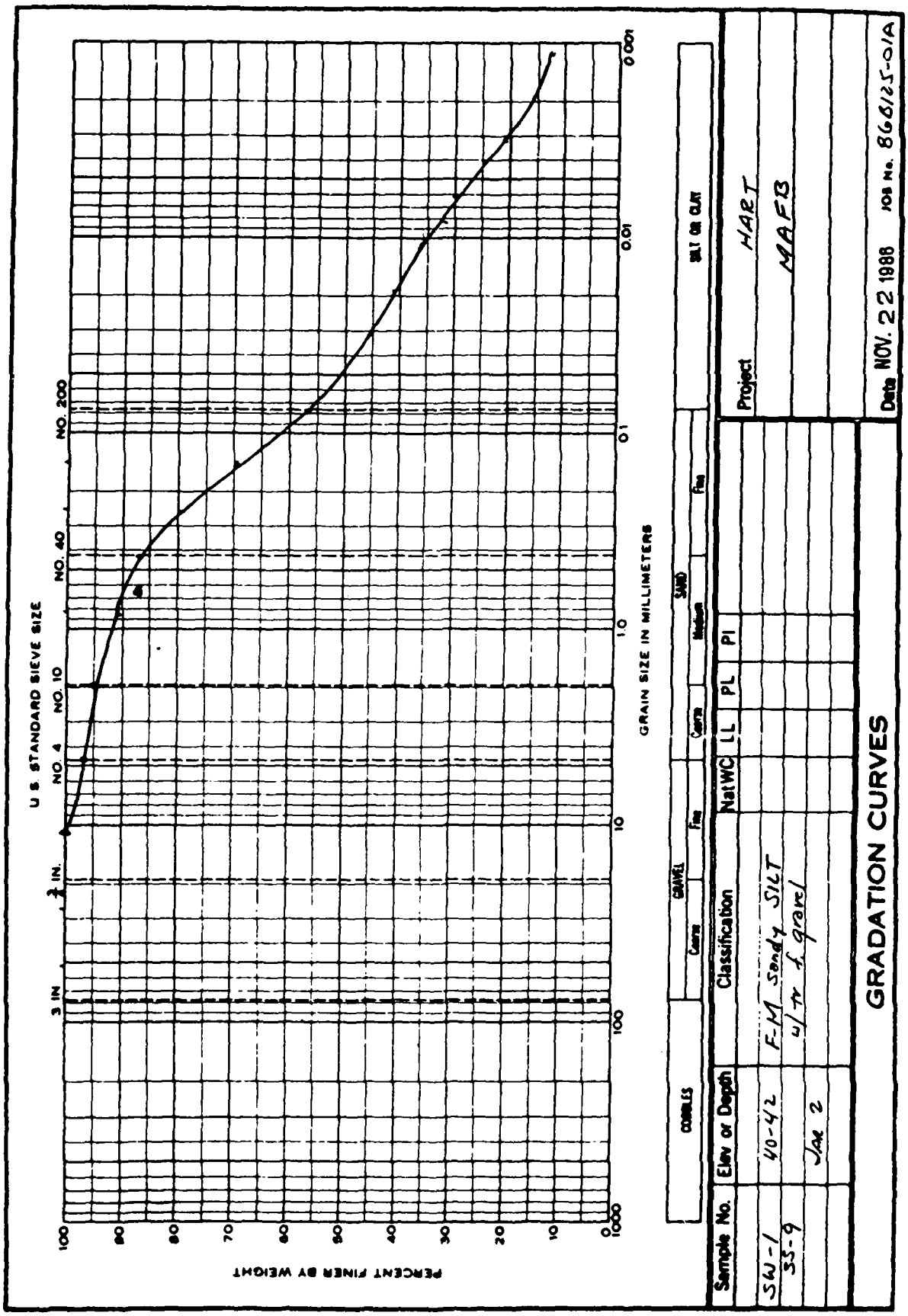
BORING NO. SW-1 SAMPLE NO. SS-9

DEPTH 40-42 MAT. DESCRIPTION SOIL JAR #2

DATE 11-22-86 BY JB

SIEVE SIZE	WT. GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	1.40	97.752
NO. 10	1.70	95.024
NO. 20	2.00	91.813
NO. 40	2.30	87.319
NO. 60	4.70	79.775
NO. 100	5.40	73.502
NO. 200	7.50	67.303

DIAMETER(MM)	PERCENT PASSING
.03042830	46.6117
.01980126	41.3335
.01177859	36.0044
.00846871	32.8549
.00604933	30.7352
.00317297	21.1967
.00134176	12.7180


U.S. STANDARD SIEVE SIZE
3 IN
¾ IN.
NO. 4
NO. 10
NO. 40
NO. 200
PERCENT FINER BY WEIGHT
GRAIN SIZE IN MILLIMETERS
COBBLES
GRAVEL
SAND
SILT OR CLAY
Coarse
Fine
Coarse
Medium
Fine
Project MART
MAFB
Data NOV. 22 1988
JOB No. 866125-01A
GRADATION CURVES
Sample No.
Elev or Depth
Classification
Nat WC
LL
PL
PI
SW-1
33-9
40-42
Jar 2
F-M Sandy SILT
w/tr f gravel

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

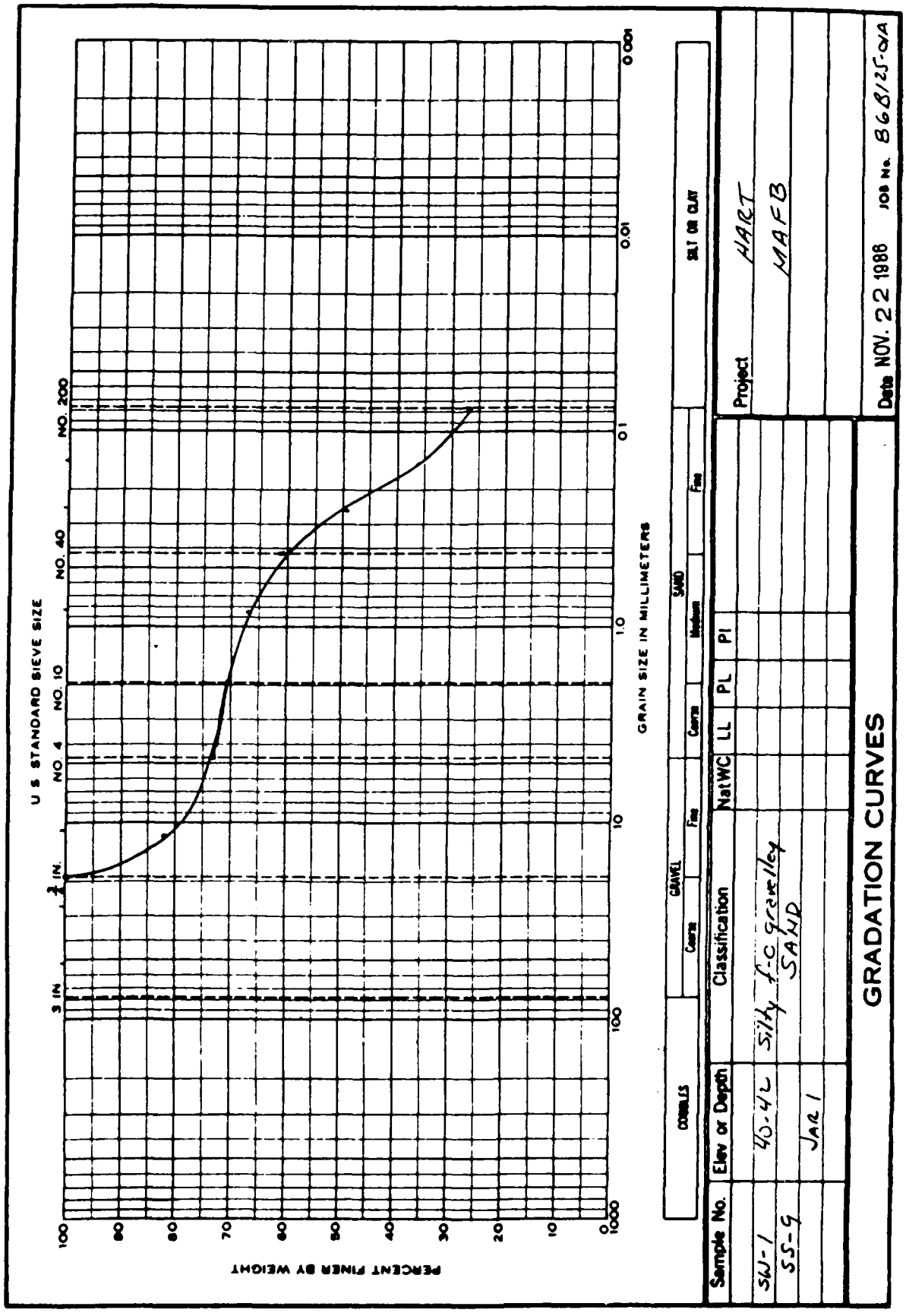
PROJECT LOCATION MAFB

BORING NO. SW-1 SAMPLE NO. SS-9

DEPTH 40-42 MAT. DESCRIPTION SOIL

DATE 11-22-86 BY JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	13.40	32.705
NO. 4	11.40	73.540
NO. 10	3.50	78.877
NO. 20	4.30	87.113
NO. 40	7.11	91.738
NO. 60	17.20	42.375
NO. 100	17.00	33.511
NO. 200	11.40	99.345


U S STANDARD SIEVE SIZE
3 IN.
2 IN.
NO. 4
NO. 10
NO. 40
NO. 200
PERCENT FINER BY WEIGHT
GRAIN SIZE IN MILLIMETERS
COBBLES
GRAVEL
SAND
SILT OR CLAY
Coarse
Fine
Coarse
Medium
Fine
Sample No.
Elev or Depth
Classification
Nat WC
LL
PL
PI
SW-1
40.4'
Silty f-c gravelly SAND
SS-9
JAR 1
GRADATION CURVES
Project HART MAFB
Date NOV. 22 1986
JOB No. 868125-QA
J&L TESTING COMPANY

GRAIN SIZE ANALYSIS

PROJECT NAME: HART JOB NO.: 86B125-01A

PROJECT LOCATION: MAFB

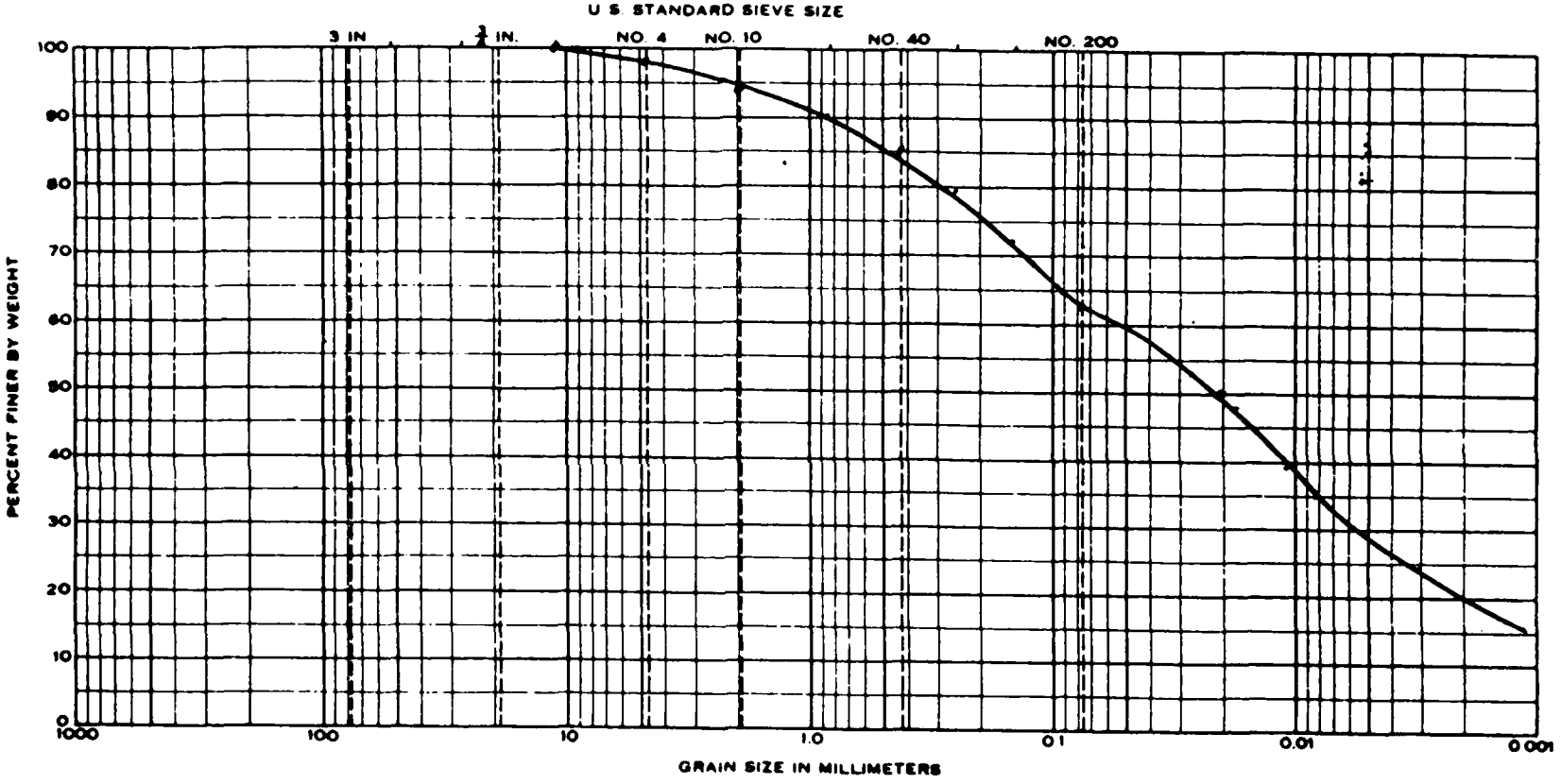
BORING NO.: SW-3 SAMPLE NO.: SS-4

DEPTH: 15-17 MAT. DESCRIPTION: SOIL

DATE: 11-22-86 BY: JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	.00	93.217
NO. 10	1.10	84.722
NO. 20	3.20	70.663
NO. 40	2.70	55.556
NO. 60	4.20	73.372
NO. 100	5.70	72.259
NO. 200	5.40	53.599

DIAMETER(MM)	PERCENT PASSING
.0277771	51.5248
.0132085	48.9935
.0112516	39.4909
.0081503E	35.7299
.0059636	30.0883
.0030788	24.4467
.0013047	16.9246



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
SW-3	15-17	f-m sandy SILT					
SS-4		w/ tr coarse sand					
	Jar 1						

Project HART
MAFB

GRADATION CURVES

Date NOV. 22 1986 JOB No. 86B125-0/A

H.10-6

J & L TESTING COMPANY

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01

PROJECT LOCATION MAFB

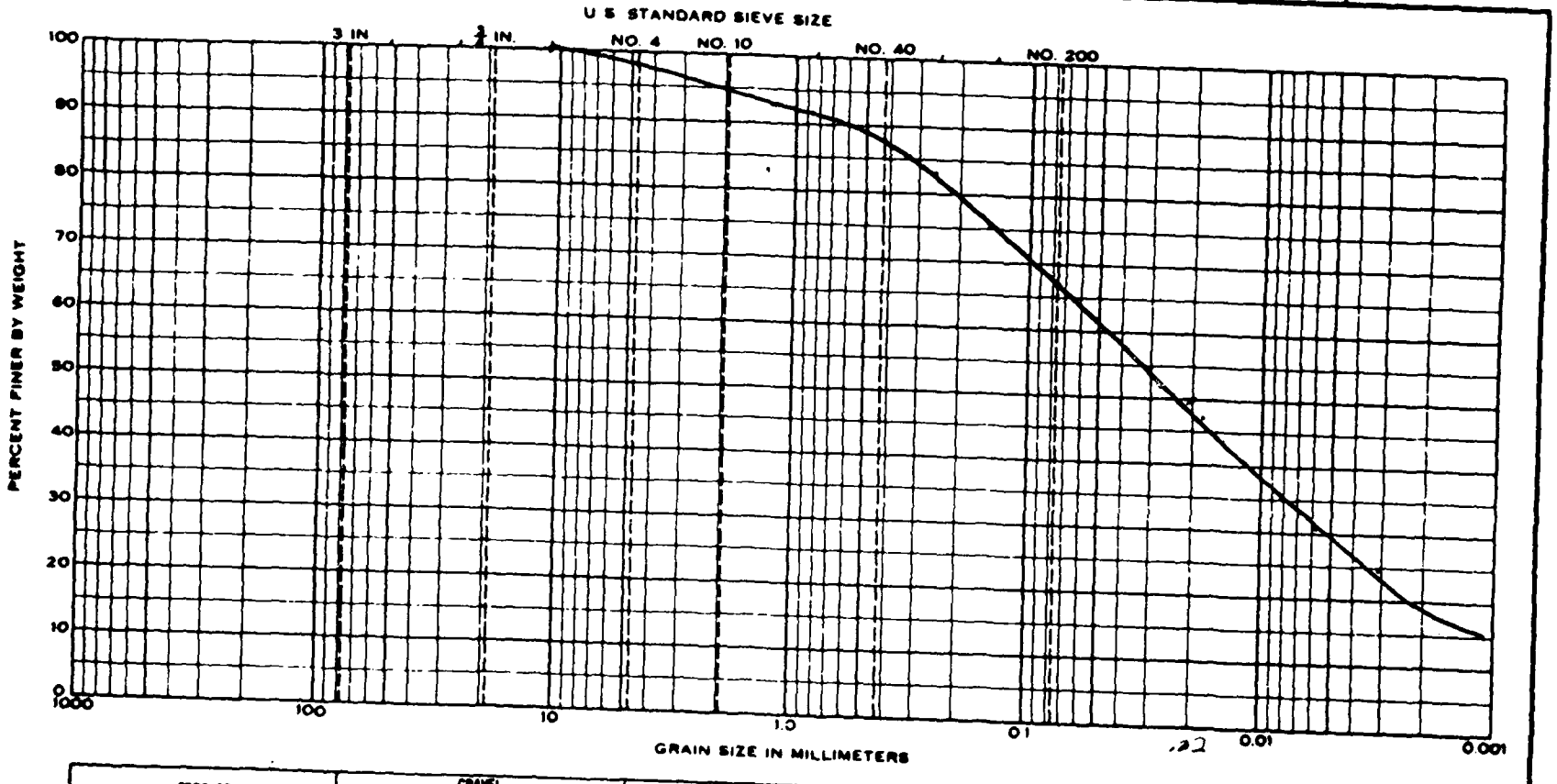
BORING NO. ~~BH-1~~ SW-3 SAMPLE NO. SS-~~10~~ 4

DEPTH 15-17 MAT. DESCRIPTION SOIL

DATE 11-22-86 BY JS

SIEVE SIZE	WT. GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.20	100.000
.75 INCH	.00	100.000
.50 INCH	.20	100.000
NO. 4	.70	98.750
NO. 10	1.70	95.714
NO. 20	1.70	92.679
NO. 40	2.40	88.392
NO. 60	3.00	83.035
NO. 100	4.40	75.173
NO. 200	4.50	67.142

DIAMETER(MM)	PERCENT PASSING
.02824927	50.2557
.01842688	17.5851
.01121616	39.3044
.00818634	35.1338
.00592661	31.3534
.00307884	24.7027
.00131874	15.2016



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI
SW-3	15-17	m-f sandy SILT				
SS-4	Jar 2					

GRADATION CURVES

Project HART MAFB

Date NOV. 22 1986 JOB No. 868125-01A

J & L TESTING COMPANY

H.10-8

GRAIN SIZE ANALYSIS

PROJECT NAME: HART JOB NO. 96B125-01A

PROJECT LOCATION: MAFB

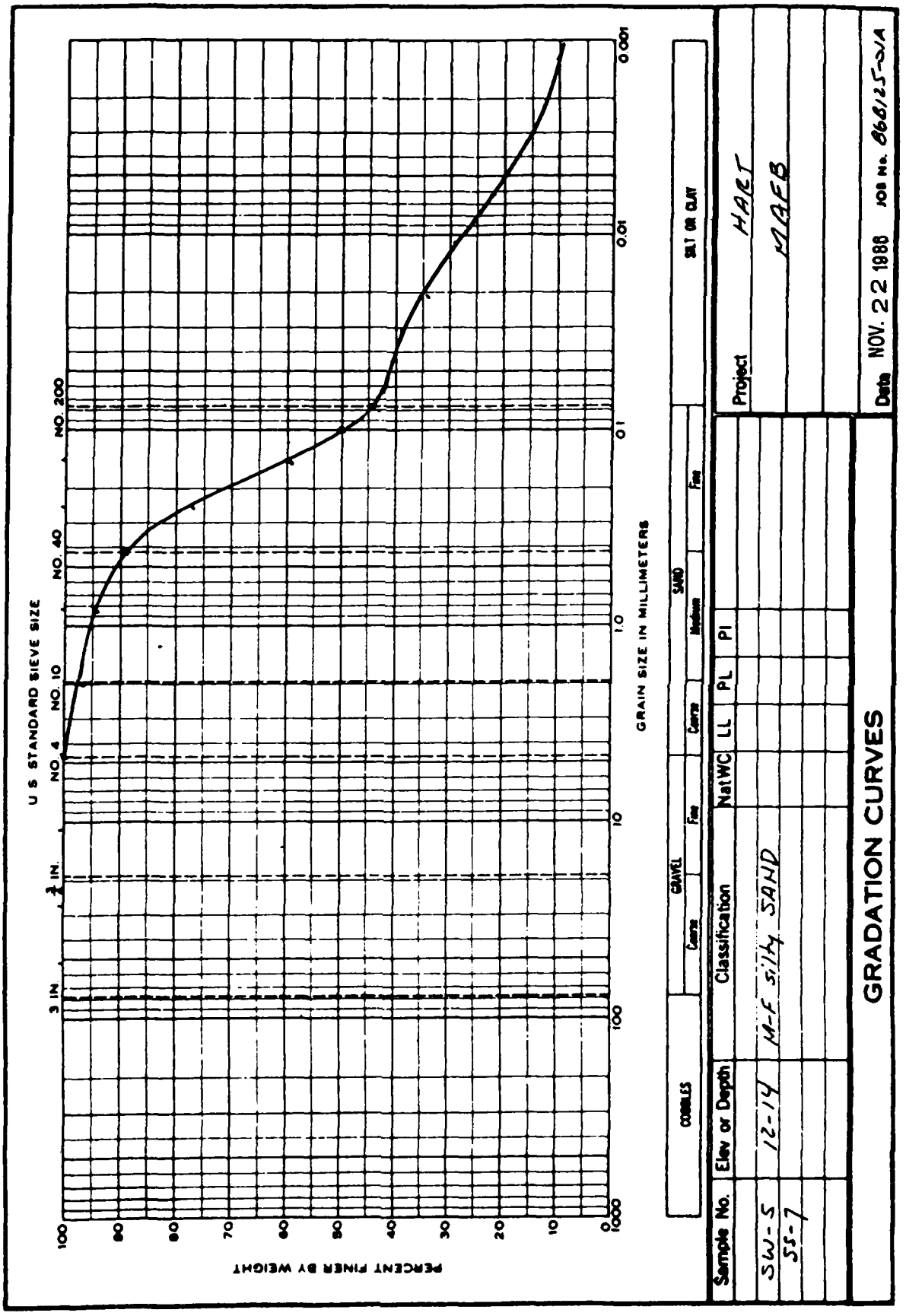
BORING NO. SW-5 SAMPLE NO. SS-7

DEPTH: 12-14 MAT. DESCRIPTION: SOIL

DATE: 11-22-96 BY: JB

SIEVE SIZE	AT.SME	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	.00	100.000
NO. 10	3.00	97.[illegible]
NO. 20	3.40	94.[illegible]
NO. 40	5.40	89.134
NO. 60	12.10	[illegible].3[illegible]
NO. 100	20.10	55.[illegible]
NO. 200	15.30	44.763

DIAMETER(MM)	PERCENT PASSING
.030093109	39.5711
.020144011	34.7451
.011976556	29.3136
.008708827	25.3939
.006205523	23.1535
.00321314	18.4075
.001346559	10.8166


PERCENT FINER BY WEIGHT
100
90
80
70
60
50
40
30
20
10
0
U S STANDARD SIEVE SIZE
3 IN
2 IN.
NO. 4
NO. 10
NO. 40
NO. 200
1000
100
10
1.0
0.1
0.01
0.001
GRAIN SIZE IN MILLIMETERS
COBBLES
GRAVEL
Coarse
Fine
SAND
Coarse
Medium
Fine
SILT OR CLAY
Sample No.
Elev or Depth
Classification
Nat WC
LL
PL
PI
SW-S
12-14
M-F silty SAND
SS-7
Project
HAET
MAEB
Date NOV. 22 1988
JOB No. 86125-SA
GRADATION CURVES
J & L TESTING COMPANY

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B135-01A

PROJECT LOCATION MAFB

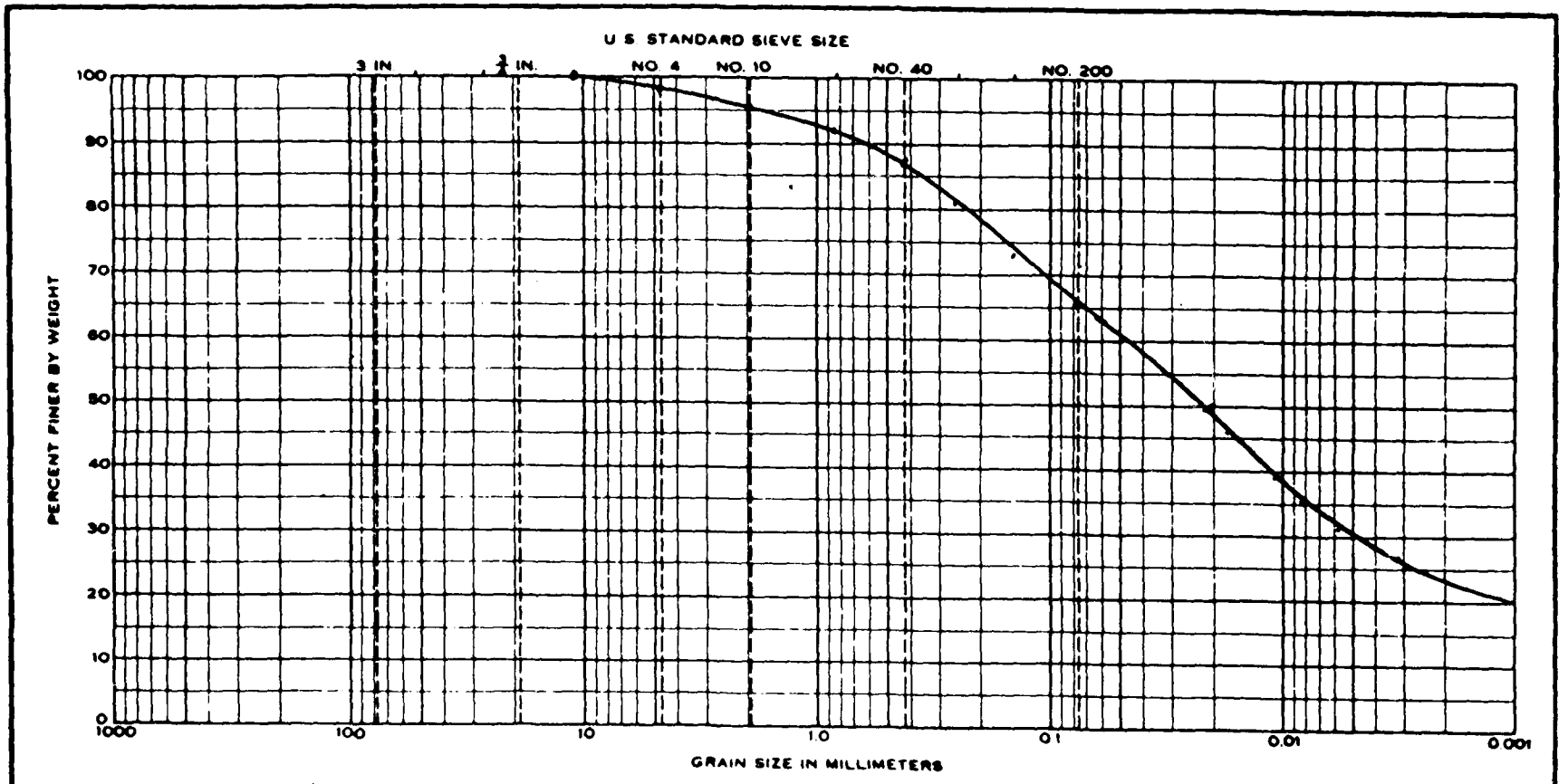
BORING NO. SW-8 SAMPLE NO. SS-5

DEPTH 13-15 MAT. DESCRIPTION SOIL

DATE 11-22-86 BY JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	1.40	93.741
NO. 10	3.70	85.413
NO. 20	3.70	77.086
NO. 40	3.80	68.589
NO. 60	5.50	56.244
NO. 100	3.70	47.920
NO. 200	9.40	36.467

DIAMETER (MM)	PERCENT PASSING
.0290141	33.2387
.0196396	46.4099
.0112161	39.7790
.0081884	35.3434
.0059266	31.2549
.0030246	27.4665
.0012105	20.9366



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
SW-8	13-15	f-m sandy SILT					
SS-6							
	Jar 2						

GRADATION CURVES

Project HART
MAFB

Date NOV. 22 1986 Job No. 86B125-01A

H.10-12

J & L TESTING COMPANY

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 963125-01A

PROJECT LOCATION MAFB

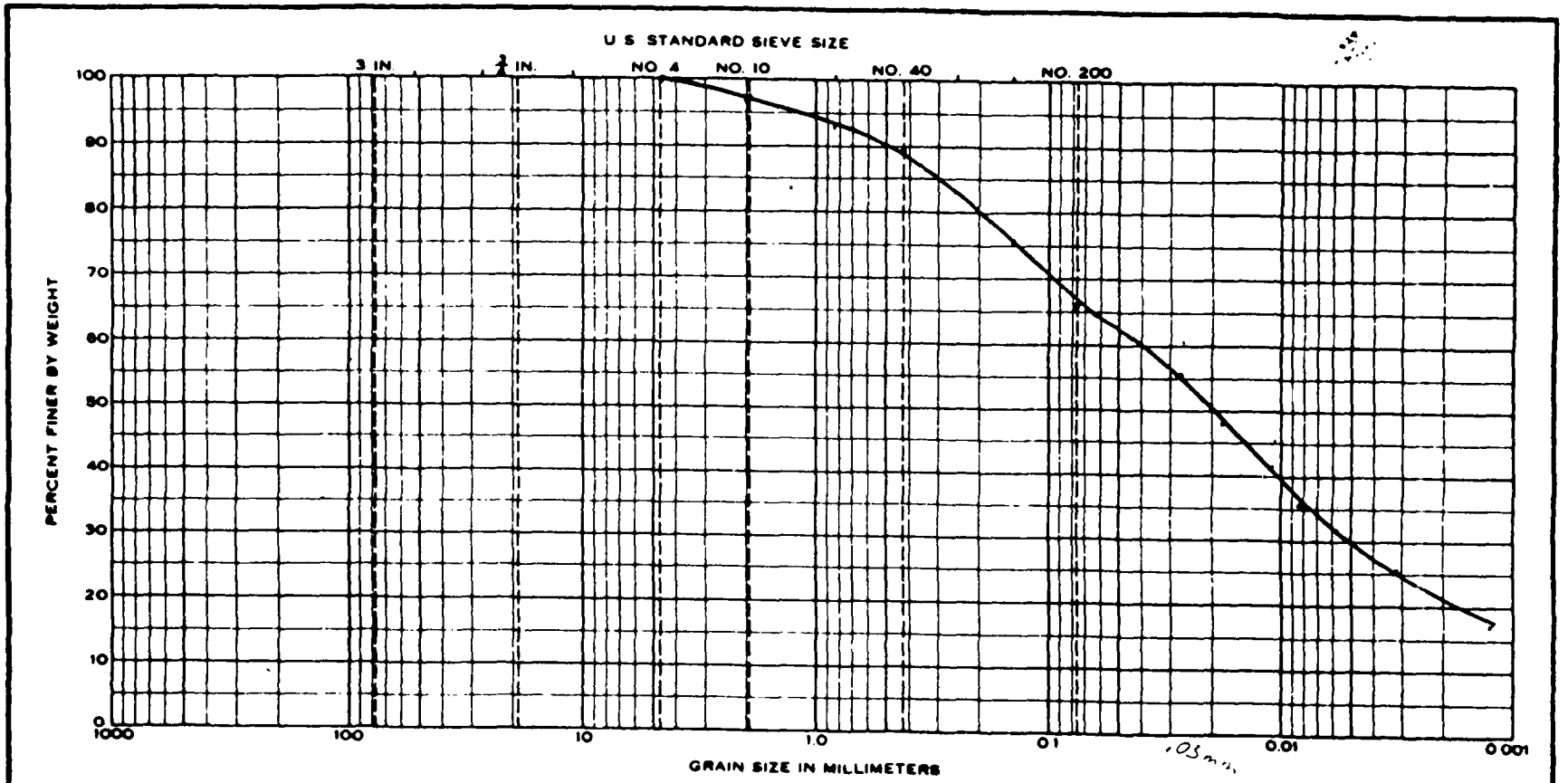
BORING NO. SW-8 SAMPLE NO. SS-6

DEPTH 13-15 MAT. DESCRIPTION SOIL

DATE 11-22-96 BY JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	.00	100.000
NO. 10	1.40	97.186
NO. 20	1.00	93.398
NO. 40	3.90	78.791
NO. 60	5.20	73.915
NO. 100	7.50	65.028
NO. 200	7.30	58.779

DIAMETER (MM)	PERCENT PASSING
.02777711	56.3454
.01349689	49.1861
.0111[illegible]362	41.[illegible]211
.00815035	36.[illegible]373
.00588929	32.3347
.00307884	25.1089
.0013[illegible]0474	17.[illegible]331



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
SW-8 SS-6	13-15	f-m sandy SILT					
	Jar 1						

GRADATION CURVES

Project HART MAFB

Date NOV. 22 1986 JOB No. 86B125-01A

J & L TESTING COMPANY

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

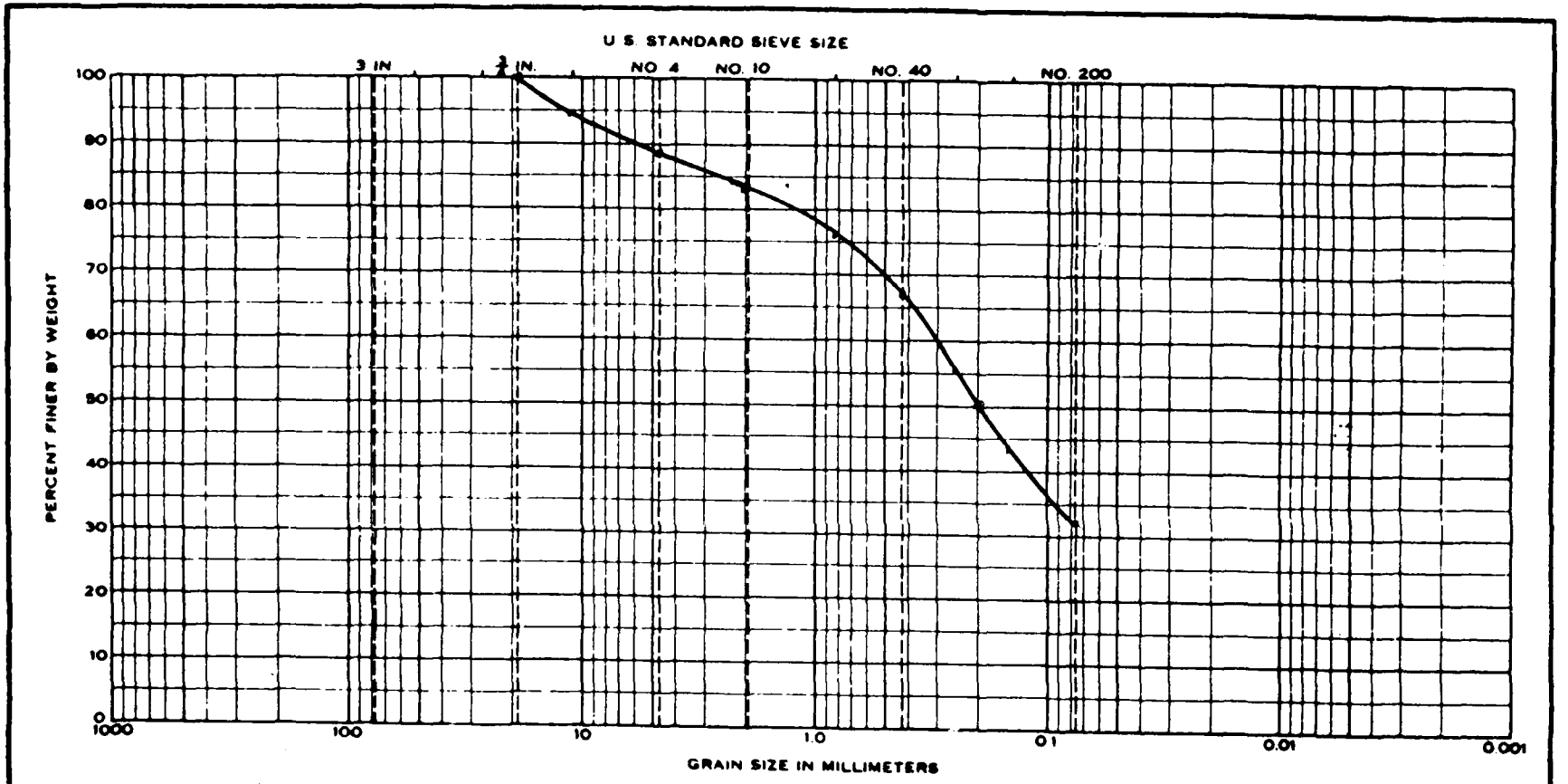
PROJECT LOCATION MAFB

BORING NO. SW-9 SAMPLE NO. SS-6

DEPTH 15-17 MAT. DESCRIPTION SOIL

DATE 11-22-86 BY JB

SIEVE SIZE	WT. GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	5.00	34.520
NO. 4	3.00	30.567
NO. 10	3.00	30.131
NO. 20	10.00	26.452
NO. 40	13.40	27.451
NO. 60	17.50	25.882
NO. 100	11.70	43.779
NO. 200	17.10	32.145



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
SW-9 SS-6	15-17 Jar 1	silty c-f SAND					

Project HART MAFB

Date NOV. 22 1986 Job No. 868125-01A

GRADATION CURVES

J & L TESTING COMPANY

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GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

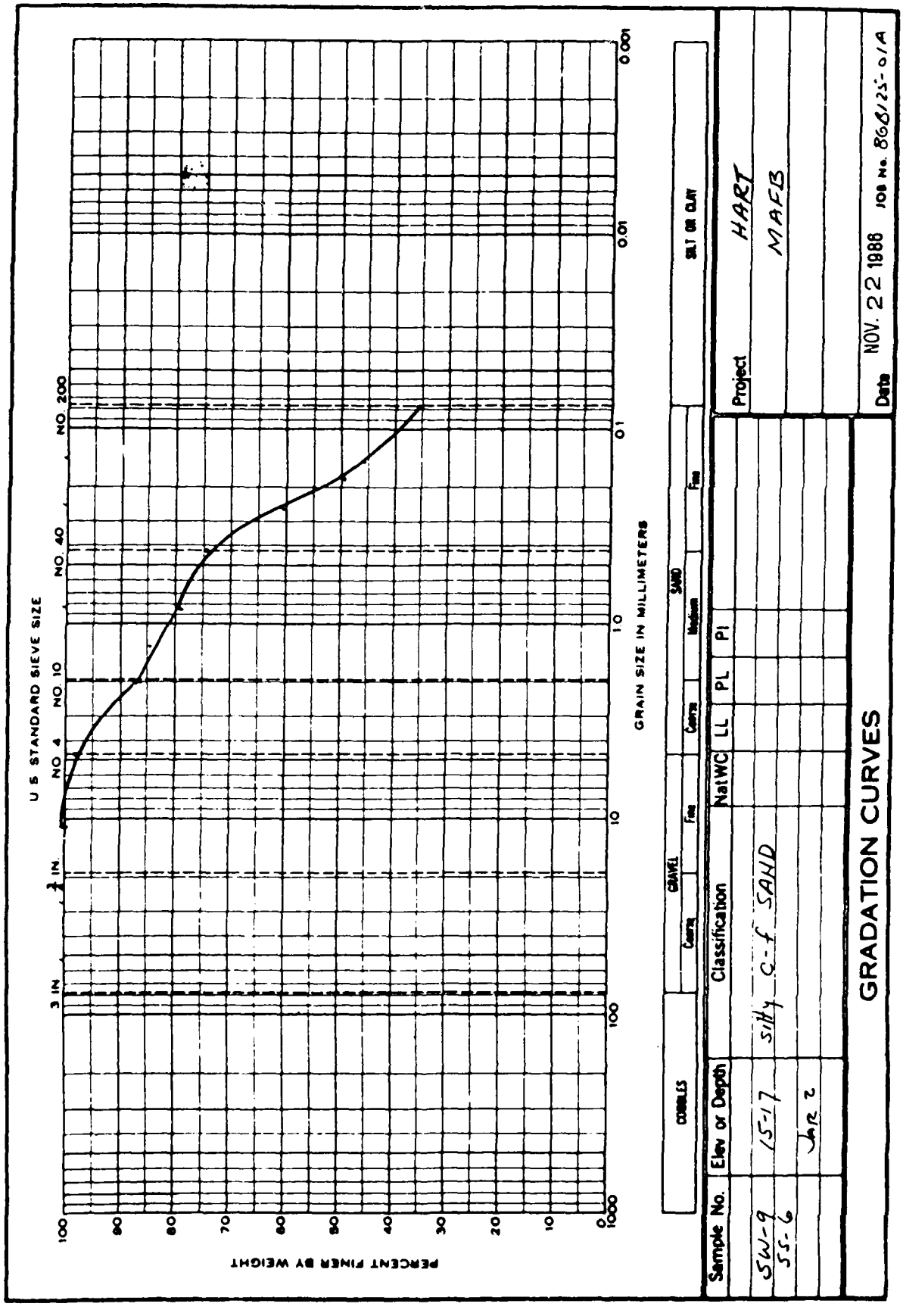
PROJECT LOCATION MAFB

BORING NO. SW-9 SAMPLE NO. SS-6

DEPTH 15-17 MAT. DESCRIPTION SOIL

DATE 11-22-86 BY JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	2.50	98.368
NO. 10	15.40	87.381
NO. 20	13.40	79.506
NO. 40	[illegible]	[illegible]
NO. 60	11.00	61.416
NO. 100	[illegible]	[illegible]
NO. 200	13.90	38.111


U S STANDARD SIEVE SIZE
3 IN
½ IN
NO 4
NO 10
NO 40
NO 200
PERCENT FINER BY WEIGHT
GRAIN SIZE IN MILLIMETERS
COBBLES
GRAVEL
SAND
SILT OR CLAY
Coarse
Fine
Coarse
Medium
Fine
Sample No.
Elev or Depth
Classification
Nat WC
LL
PL
PI
SW-9
SS-6
15-17
Jar 2
silty c-f SAND
Project
HART
MAFB
Date
NOV. 22 1988
JOB No. 86825-01A
GRADATION CURVES

GRAIN SIZE ANALYSIS

PROJECT NAME: HART — JOB NO.: 86B125-01A

PROJECT LOCATION: MAFB

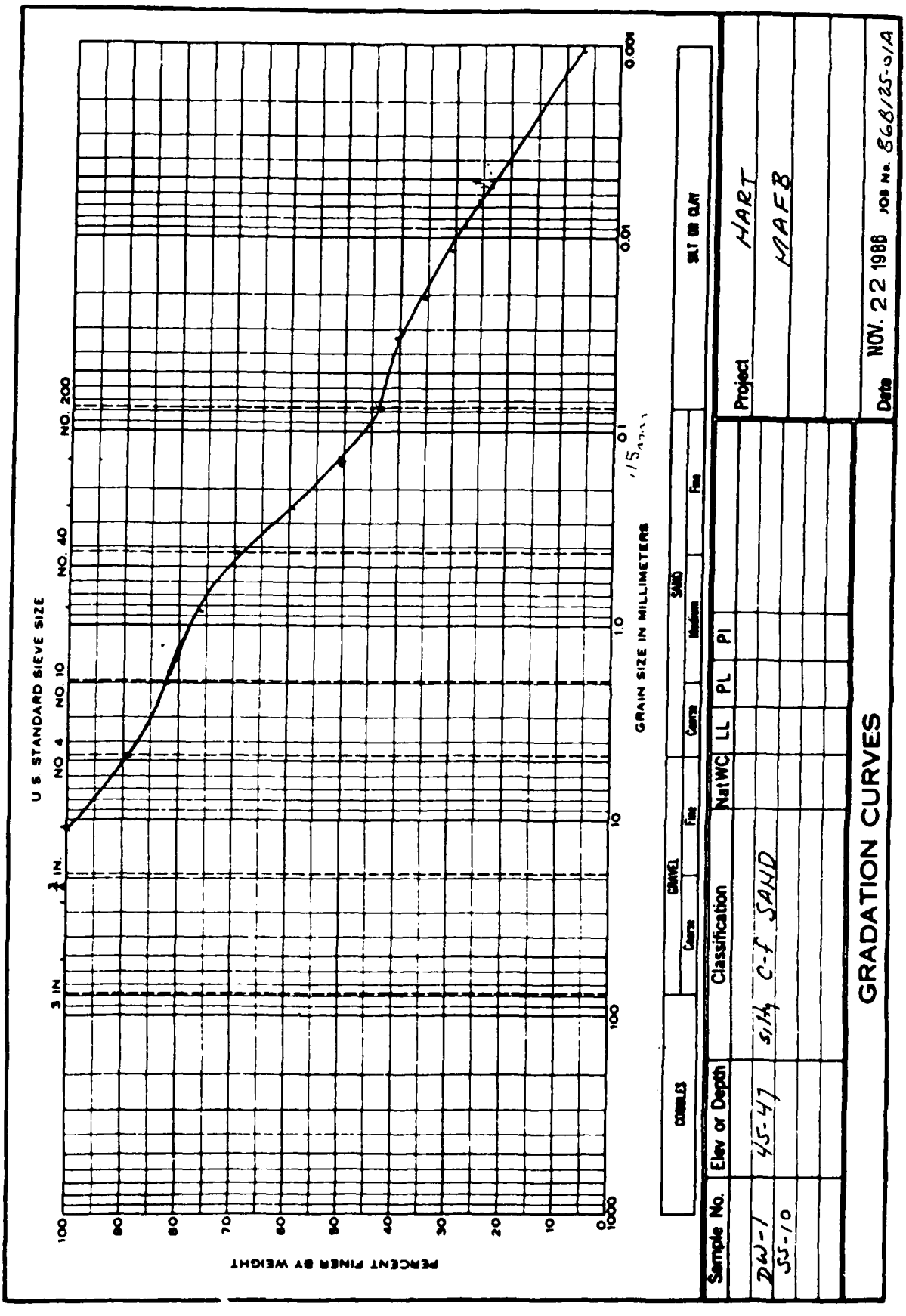
BORING NO.: BW-1 — SAMPLE NO.: SS-10

DEPTH: 45-47 — MAT. DESCRIPTION: SOIL

DATE: 11-22-86 — BY: JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	9.50	89.382
NO. 10	7.20	82.215
NO. 20	4.90	76.396
NO. 40	6.30	69.648
NO. 60	5.40	64.637
NO. 100	5.50	58.479
NO. 200	5.30	48.237

DIAMETER(MM)	PERCENT PASSING
.0024613	42.4125
.0009554	38.5219
.0013536	31.3480
.0008256	28.1732
.0003109	25.7134
.0002416	18.3738
.0001377	7.3435


U.S. STANDARD SIEVE SIZE
3 IN
1½ IN
NO. 4
NO. 10
NO. 40
NO. 200
PERCENT FINER BY WEIGHT
GRAIN SIZE IN MILLIMETERS
COBBLES
GRAVEL
Coarse
Fine
SAND
Coarse
Medium
Fine
SILT OR CLAY
Sample No.
Elev or Depth
Classification
Nat WC
LL
PL
PI
DW-1
45-47
SILTY C-F SAND
SS-10
GRADATION CURVES
Project
HART
MAFB
Date
NOV. 22 1988
JOB No. 868/25-91A
J&L TESTING COMPANY

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

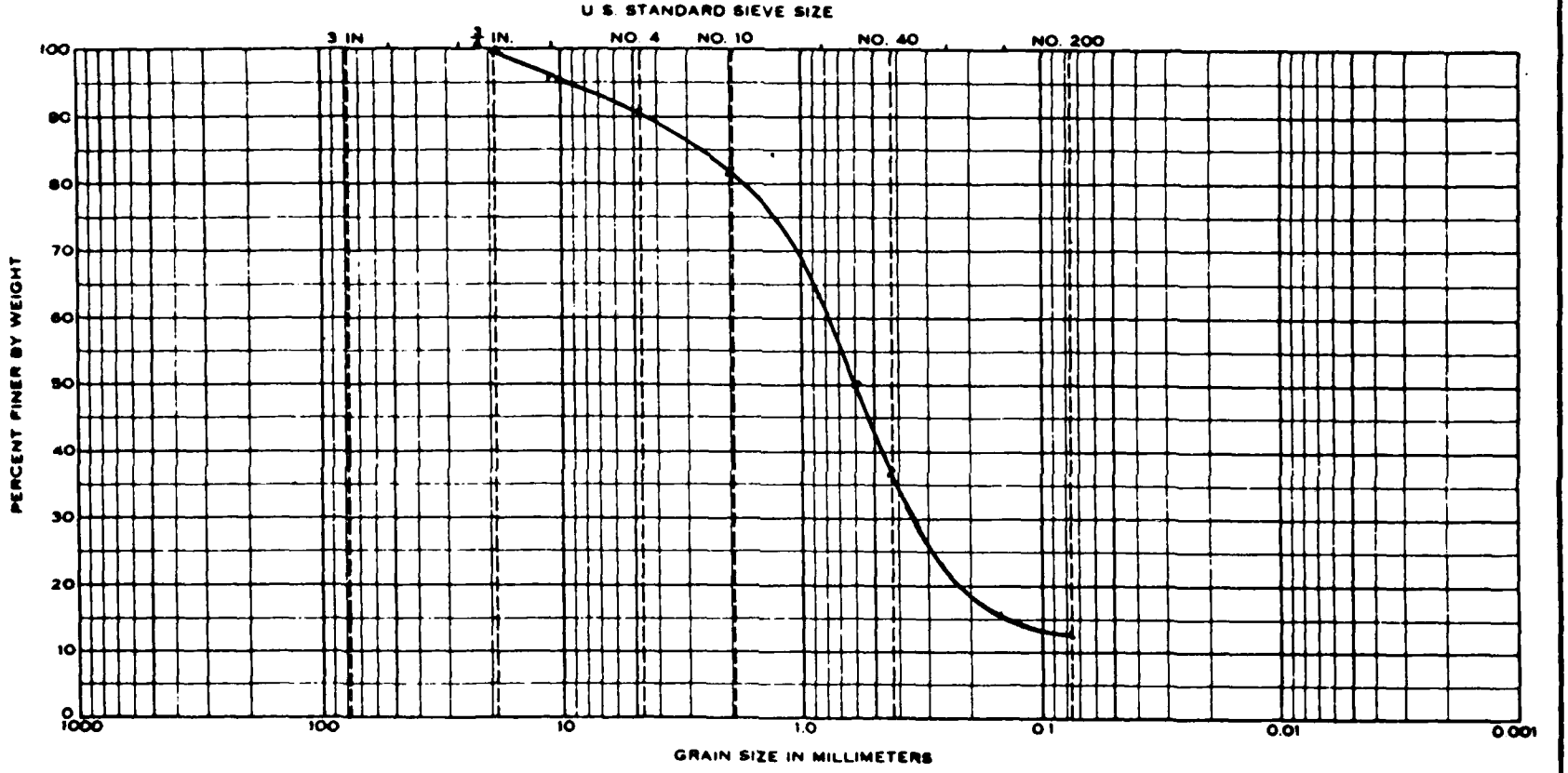
PROJECT LOCATION MAFB

BORING NO. DW-2 SAMPLE NO. SS-6

DEPTH 10-12 MAT. DESCRIPTION SOIL

DATE 11-20-86 BY JP

SIEVE SIZE	WT. GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	5.70	95.352
NO. 4	9.40	91.235
NO. 10	15.90	82.520
NO. 20	15.30	73.964
NO. 40	11.30	67.387
NO. 60	10.00	61.734
NO. 100	12.10	55.093
NO. 200	5.50	52.054



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
DW-2	10-12	C-F silty SAND					
SS-6							
	Jar 2						

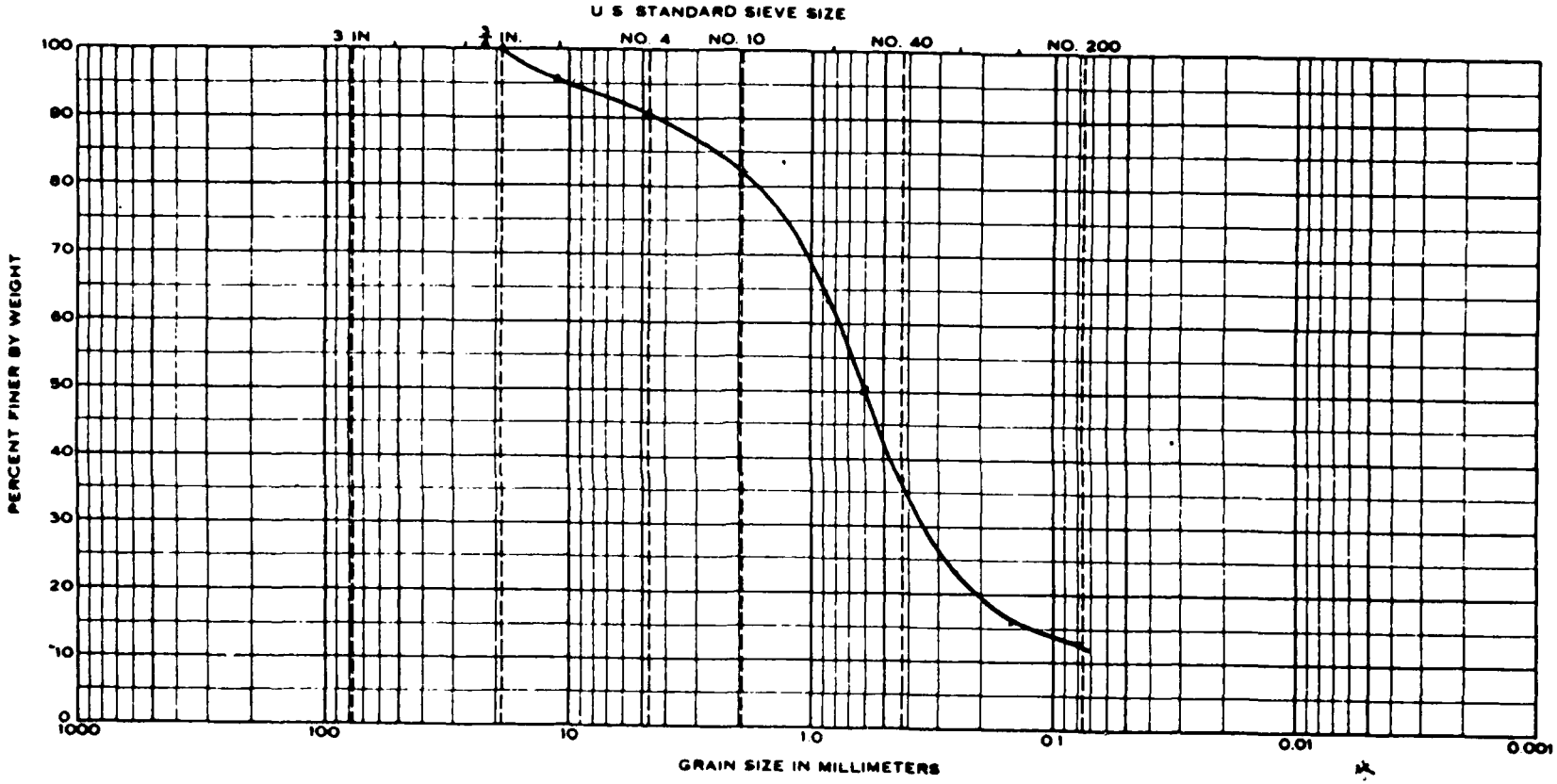
Project HART MAFB

GRADATION CURVES

Date NOV. 22 1986 JOB No. BGB125-01A

J & L TESTING COMPANY

H.10-22



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
DW-2 SS-6	10-12	C-F silty SAND					
	JAR 1						

GRADATION CURVES

Project HART MAFB

Date NOV. 22 1986 JOB No. 86B125-01A

J & L TESTING COMPANY

H.10-23

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

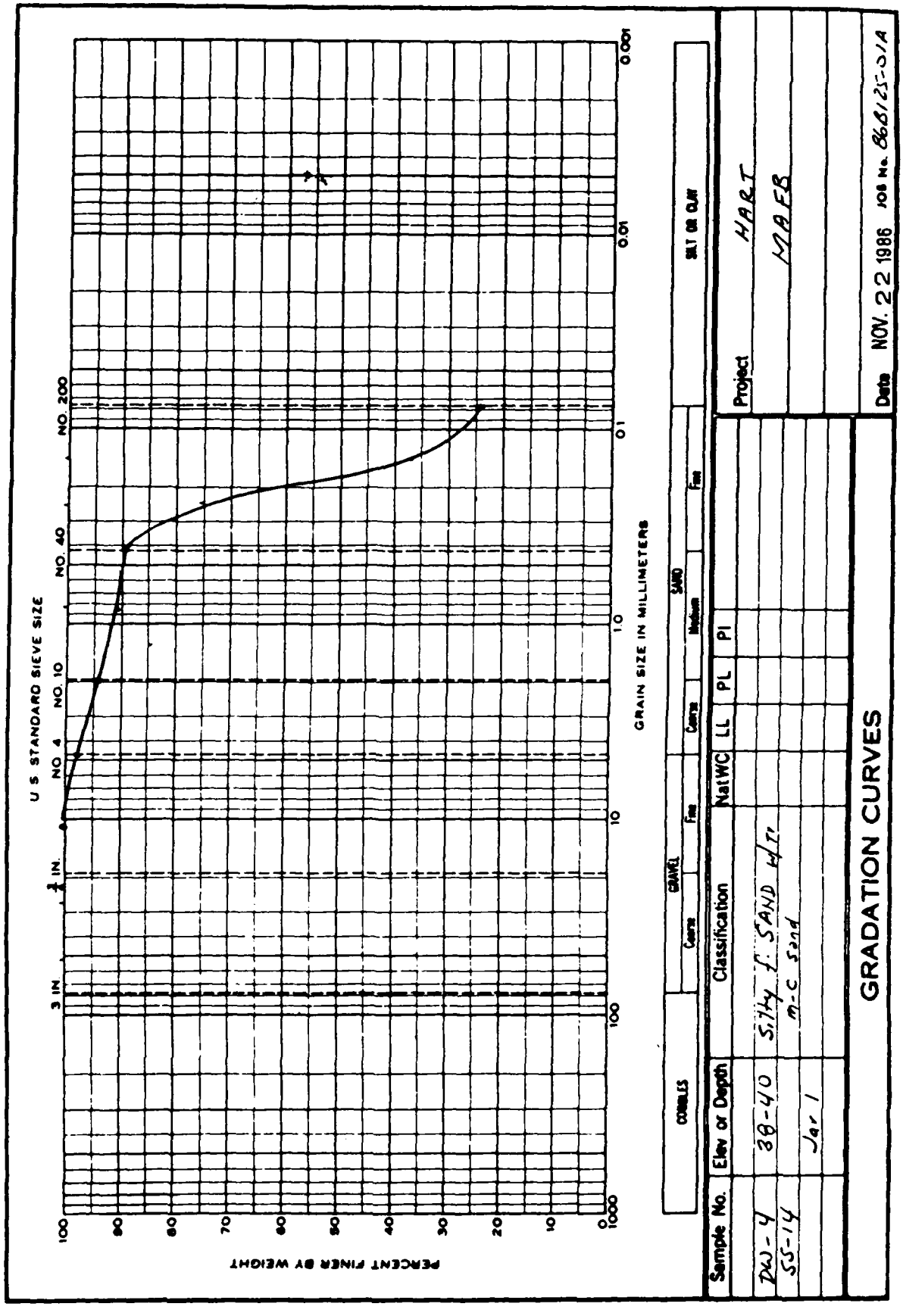
PROJECT LOCATION MAFB

BORING NO. DW-4 SAMPLE NO. SS-14

DEPTH 38-40 MAT. DESCRIPTION SOIL

DATE 11-22-86 BY JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	2.30	95.536
NO. 10	5.70	84.367
NO. 20	3.30	91.514
NO. 40	3.20	88.173
NO. 60	12.30	75.274
NO. 100	51.30	17.746
NO. 200	17.70	14.799


U S STANDARD SIEVE SIZE
3 IN
¾ IN
NO. 4
NO. 10
NO. 40
NO. 200
PERCENT FINER BY WEIGHT
GRAIN SIZE IN MILLIMETERS
COBBLES
GRAVEL
Coarse
Fine
SAND
Coarse
Medium
Fine
SILT OR CLAY
Sample No.
Elev or Depth
Classification
Nat WC
LL
PL
PI
DW-4
SS-14
30-40
Jar 1
Project
HART
MAER
Date
NOV. 22 1986
Job No. 86125-01A
GRADATION CURVES

GRAIN SIZE ANALYSIS

PROJECT NAME: HART JOB NO. 36B125-01A

PROJECT LOCATION: MAFB

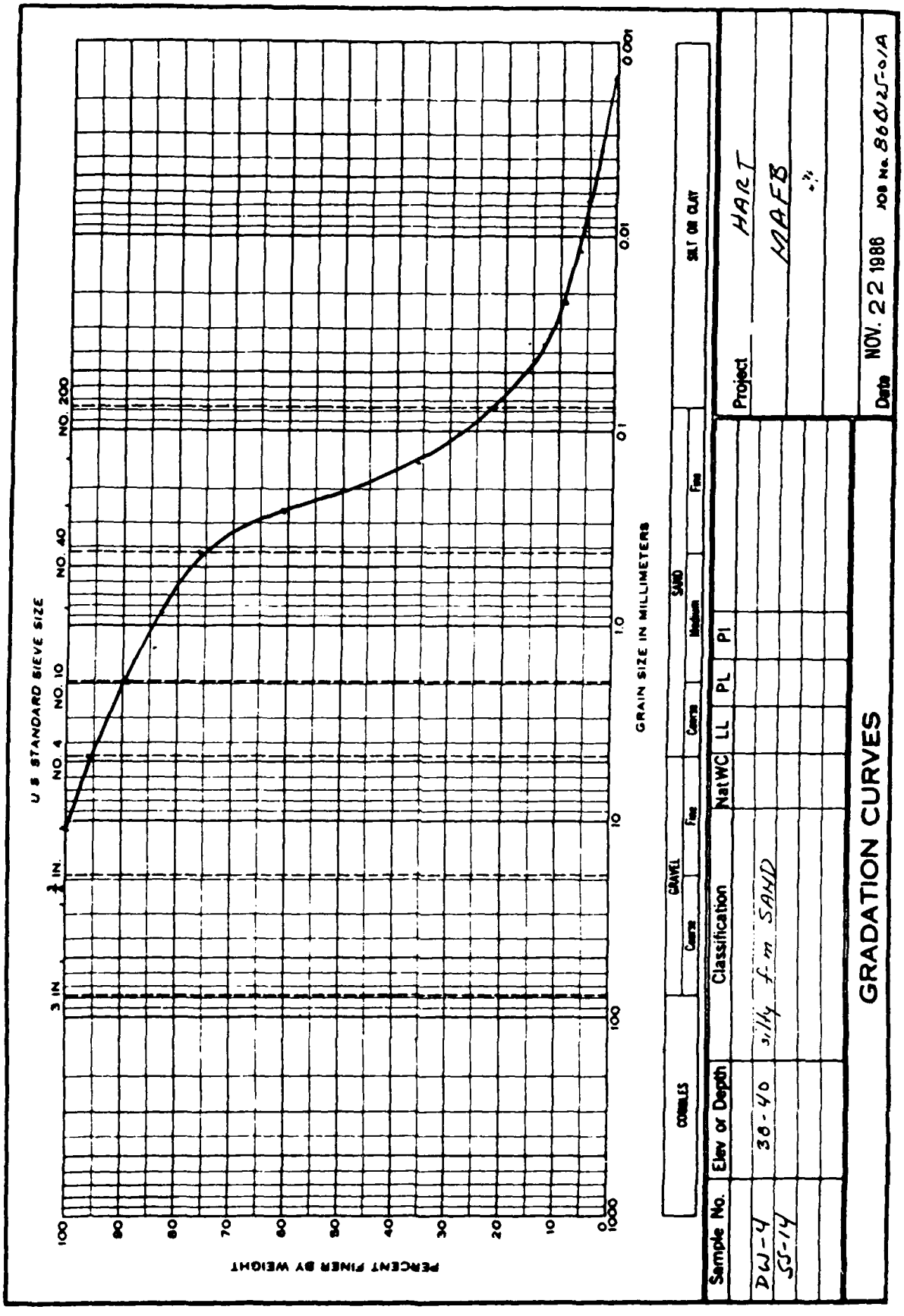
BORING NO. DW-4 SAMPLE NO. SS-14

DEPTH: 38-40 MAT. DESCRIPTION: SOIL

DATE: 11-22-86 BY: JB

SIEVE SIZE	WT. GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	3.40	96.315
NO. 10	7.40	89.087
NO. 20	8.40	81.095
NO. 40	7.40	73.865
NO. 60	15.20	61.797
NO. 100	27.60	35.355
NO. 200	14.60	22.134

DIAMETER(MM)	PERCENT PASSING
.03581002	13.3040
.02288633	9.8149
.01306824	7.1381
.00949930	5.2458
.00674975	3.3536
.00341814	2.5793
.00141289	.3000



J&L TESTING COMPANY

APPENDIX H.11

J&L TESTING COMPANY RESULTS FOR TRIAXIAL PERMEABILITY ANALYSIS OF MAFB SUBSURFACE SOIL SAMPLES

(CL5060B/0528N)

SUMMARY OF TRIAXIAL PERMEABILITY TEST RESULTS

CLIENT:HART
PROJECT LOCATION:MAFB
SAMPLE NO.:SW-8
DESCRIPTION:ST-1
15-17
TUBE

DATE:NOV 22 1986
JOB No.:86B125-01A

CELL NO.:1 FLUID:DEAIRED B-Parameter:1.0

PHYSICAL PROPERTY DATA.....

INITIAL HEIGHT:	3.840	in	FINAL HEIGHT:	3.835	in
INITIAL DIAMETER:	2.8000	in	FINAL DIAMETER:	2.8000	in
INITIAL WET WEIGHT:	833.9	gm	FINAL WET WEIGHT:	836.0	gm
WET DENSITY =,	134.2	pcf	WET DENSITY :	134.7	pcf
MOISTURE CONTENT:	18.1	%	MOISTURE CONTENT:	18.4	%
DRY DENSITY:	113.7	pcf	DRY DENSITY:	113.8	pcf
INITIAL SATURATION:	97.6	%	FINAL SATURATION:	99.6	%
INITIAL VOID RATIO:	.509740		FINAL VOID RATIO:	.507807	

TEST PARAMETERS.....

CELL PRESSURE:	50.00	.00	.00	.00	psi
HEAD WATER:	45.00	.00	.00	.00	psi
TAIL WATER:	39.00	.00	.00	.00	psi

PERMEABILITY INPUT DATA.....

FLOW (Q):	10.20	.00	.00	.00	cc
LENGTH (L):	3.84	.00	.00	.00	in
AREA (A):	6.16	.00	.00	.00	sqin
HEAD (h):	6.00	.00	.00	.00	psi
TIME (t):	300.00	.00	.00	.00	min

COMPUTED PERMEABILITY @ 20 degrees Centigrade.....

TEST NO. 1, k=	3.293E-007	cm/sec
TEST NO. 2, k=	.000E+000	cm/sec
TEST NO. 3, k=	.000E+000	cm/sec
TEST NO. 4, k=	.000E+000	cm/sec

BY _____ DATE _____

CHK'D _____ DATE _____

Geotechnical Testing

_____ OF _____ PAGE

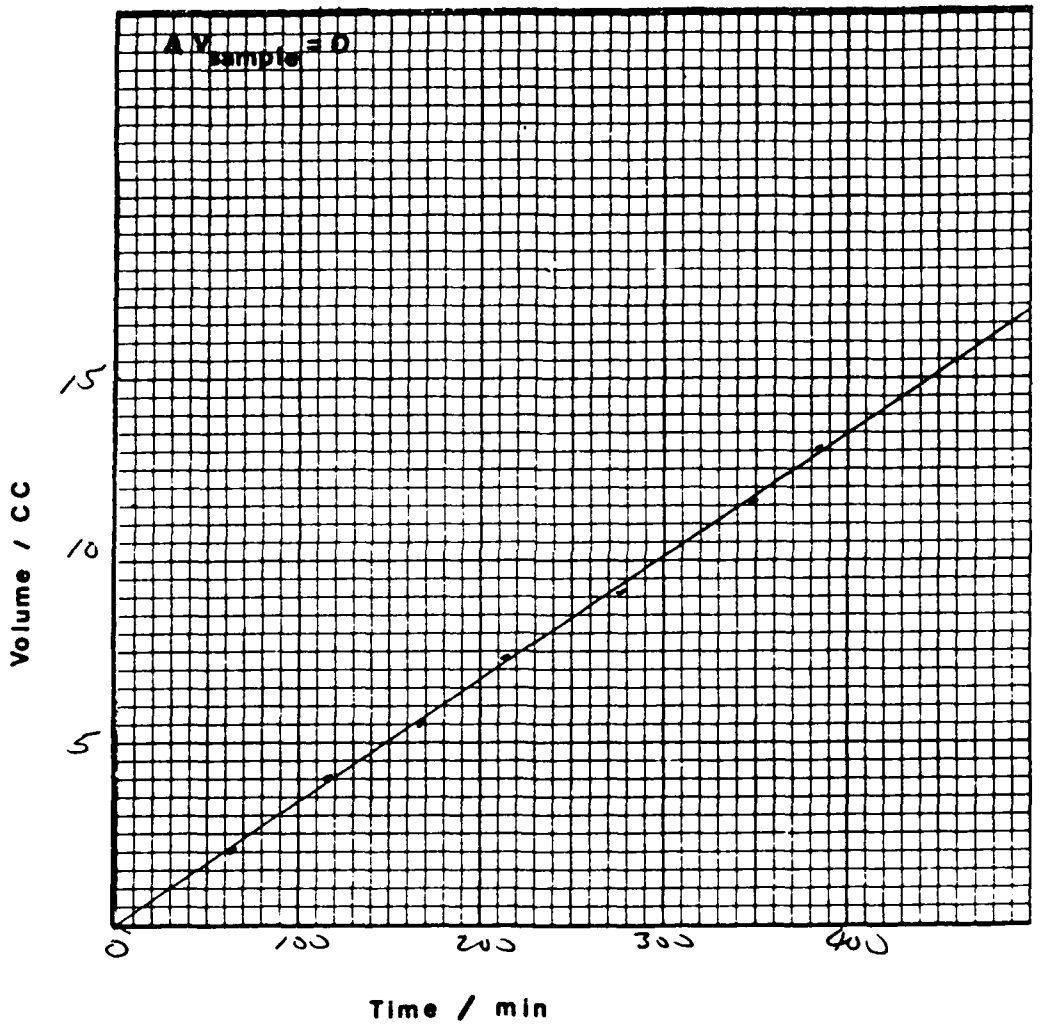
SUBJECT SW-8 JOB NO. 86B125-01

ST-1

15'-17'

$K = \frac{QL}{Aht}$

FLOW vs TIME



Q cc = 10.2

L in = 3.935

A ft² = 2.70 ϕ

h psi = 6

t sec = 18000

$k_{20°C}$ = 3.25×10^{-7} cm/sec

GRAIN SIZE ANALYSIS

PROJECT NAME: HART JOB NO. 86B125-01A

PROJECT LOCATION: MAFB

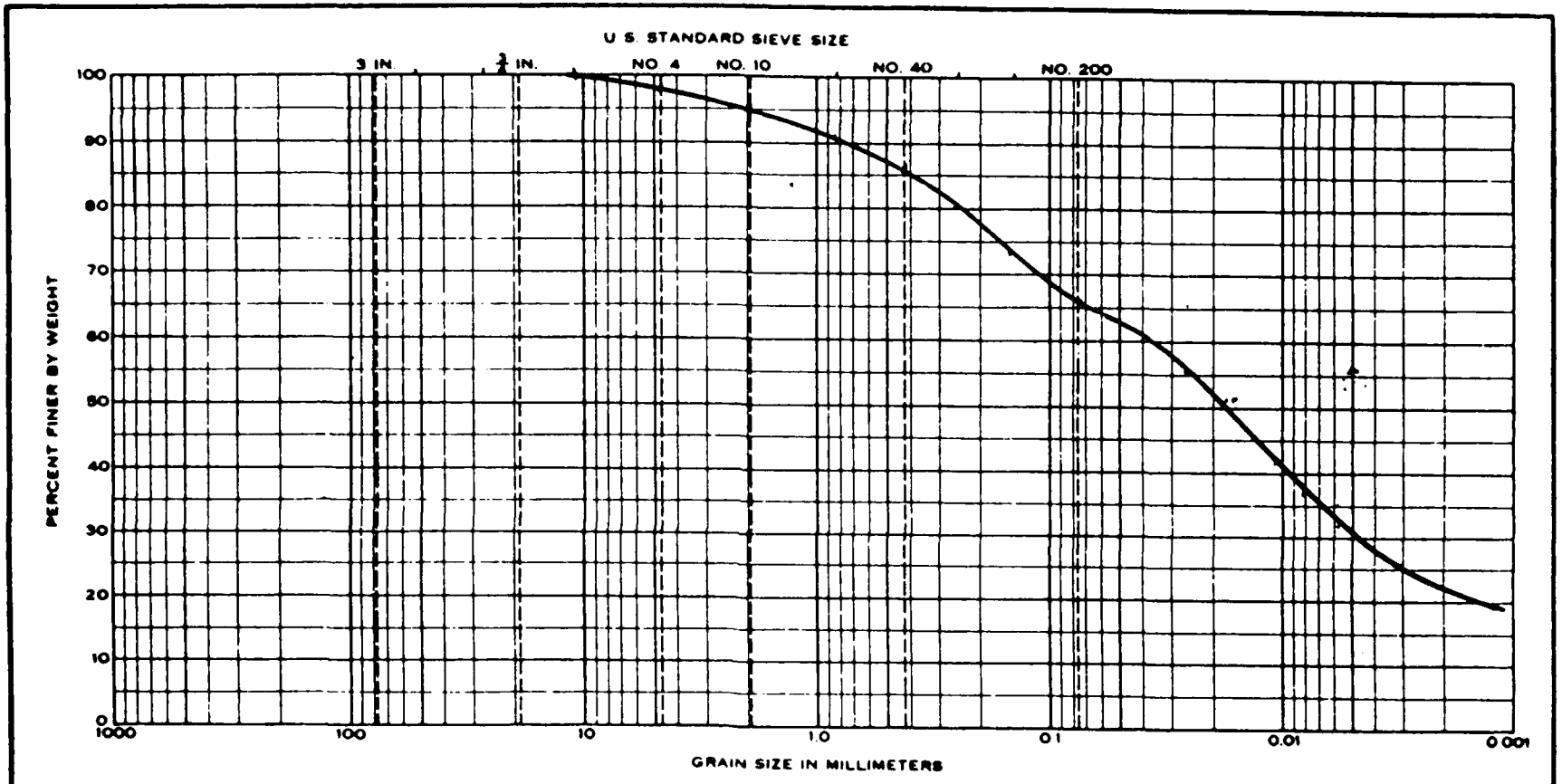
BORING NO. SW-8 SAMPLE NO. ST-1

DEPTH: 15-17 MAT. DESCRIPTION: SOIL TUBE

DATE: 11-22-86 BY: JB

SIEVE SIZE	WT. GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	1.90	99.921
NO. 10	5.30	95.627
NO. 20	6.40	91.999
NO. 40	9.20	86.768
NO. 60	11.60	80.181
NO. 100	12.30	73.283
NO. 200	11.10	66.790

DIAMETER(MM)	PERCENT PASSING
.01697190	57.3038
.01786641	52.3083
.01103119	42.7159
.00809609	37.3204
.00588929	32.2742
.00304283	26.5788
.00128820	19.9341



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
SW-B ST-1	15-17			33	19	14	

GRADATION CURVES

Project HART MAFB

Date NOV. 22 1986 JOB No. 86B125-01A

J & L TESTING COMPANY

SUMMARY OF TRIAXIAL PERMEABILITY TEST RESULTS

CLIENT:HART
PROJECT LOCATION:MAFB
SAMPLE NO.:SW-9
DESCRIPTION:ST-1
15-17
TUBE

DATE:NOV 22 1986
JOB No.:86B125-01A

CELL NO.:2 FLUID:DEAIRED B-Parameter:1.00

PHYSICAL PROPERTY DATA.....

INITIAL HEIGHT:	3.800	in	FINAL HEIGHT:	3.800	in
INITIAL DIAMETER:	2.8000	in	FINAL DIAMETER:	2.8000	in
INITIAL WET WEIGHT:	899.4	gm	FINAL WET WEIGHT:	899.4	gm
WET DENSITY =	146.3	pcf	WET DENSITY :	146.3	pcf
MOISTURE CONTENT:	12.2	%	MOISTURE CONTENT:	12.2	%
DRY DENSITY: .	130.4	pcf	DRY DENSITY:	130.4	pcf
INITIAL SATURATION:	100.5	%	FINAL SATURATION:	100.5	%
INITIAL VOID RATIO:	.339935		FINAL VOID RATIO:	.339935	

TEST PARAMETERS.....

CELL PRESSURE:	50.00	.00	.00	.00	psi
HEAD WATER:	45.00	.00	.00	.00	psi
TAIL WATER:	39.00	.00	.00	.00	psi

PERMEABILITY INPUT DATA.....

FLOW (Q):	51.00	.00	.00	.00	cc
LENGTH (L):	3.80	.00	.00	.00	in
AREA (A):	6.16	.00	.00	.00	sqin
HEAD (h):	6.00	.00	.00	.00	psi
TIME (t):	300.00	.00	.00	.00	min

COMPUTED PERMEABILITY @ 20 degrees Centigrade.....

TEST NO. 1, k=	1.632E-006	cm/sec
TEST NO. 2, k=	.000E+000	cm/sec
TEST NO. 3, k=	.000E+000	cm/sec
TEST NO. 4, k=	.000E+000	cm/sec

BY _____ DATE _____

CHK'D _____ DATE _____

Geotechnical Testing

_____ OF _____ PAGE

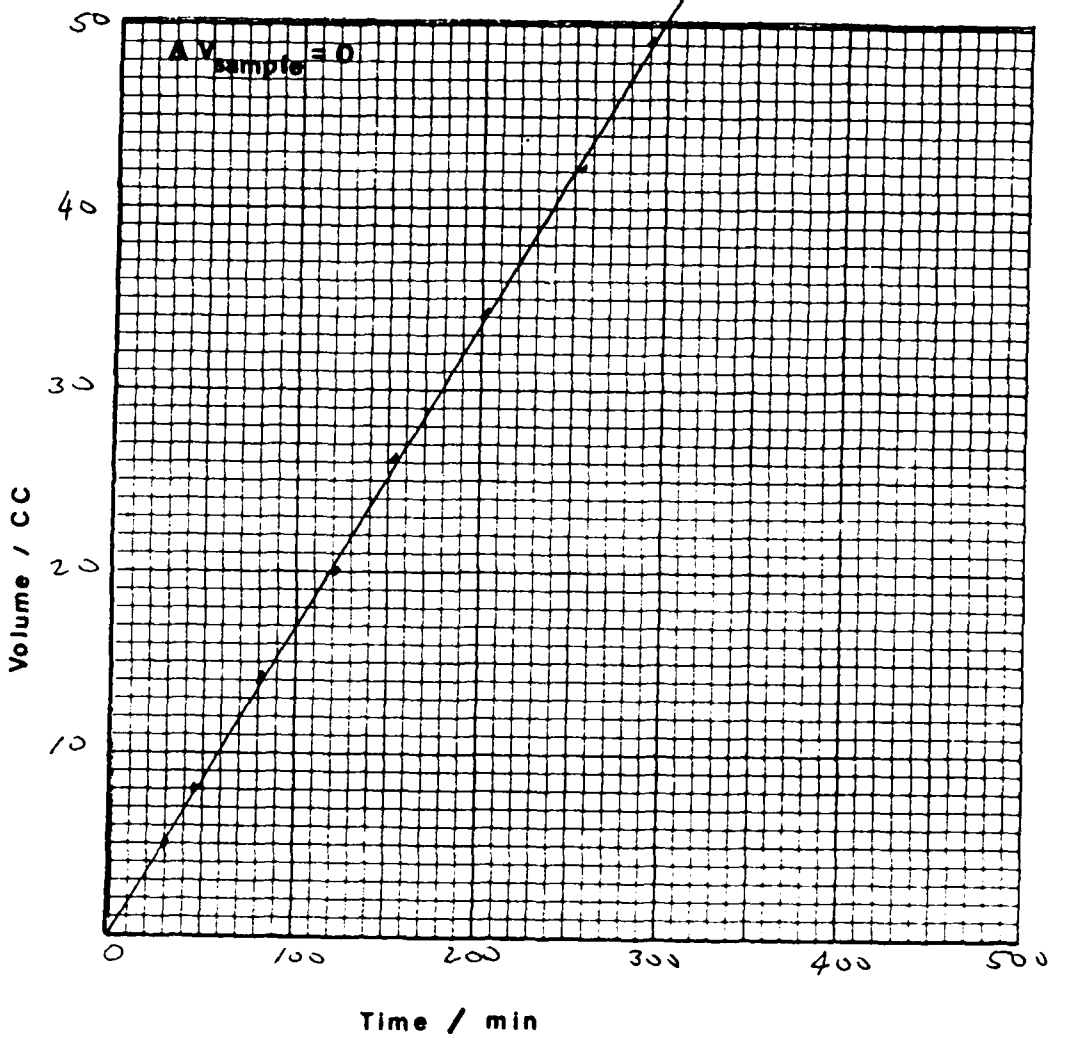
SUBJECT SW-9 JOB NO. _____

ST-L

15'-17'

$K = \frac{QL}{Aht}$

FLOW vs TIME



Q cc = 51.

L in = 3.80

A ft^2 = 2.80 ϕ

h psi = 6

t sec = 18000

$k_{20°C}$ = 1.63×10^{-4} cm/sec

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

PROJECT LOCATION MAFB

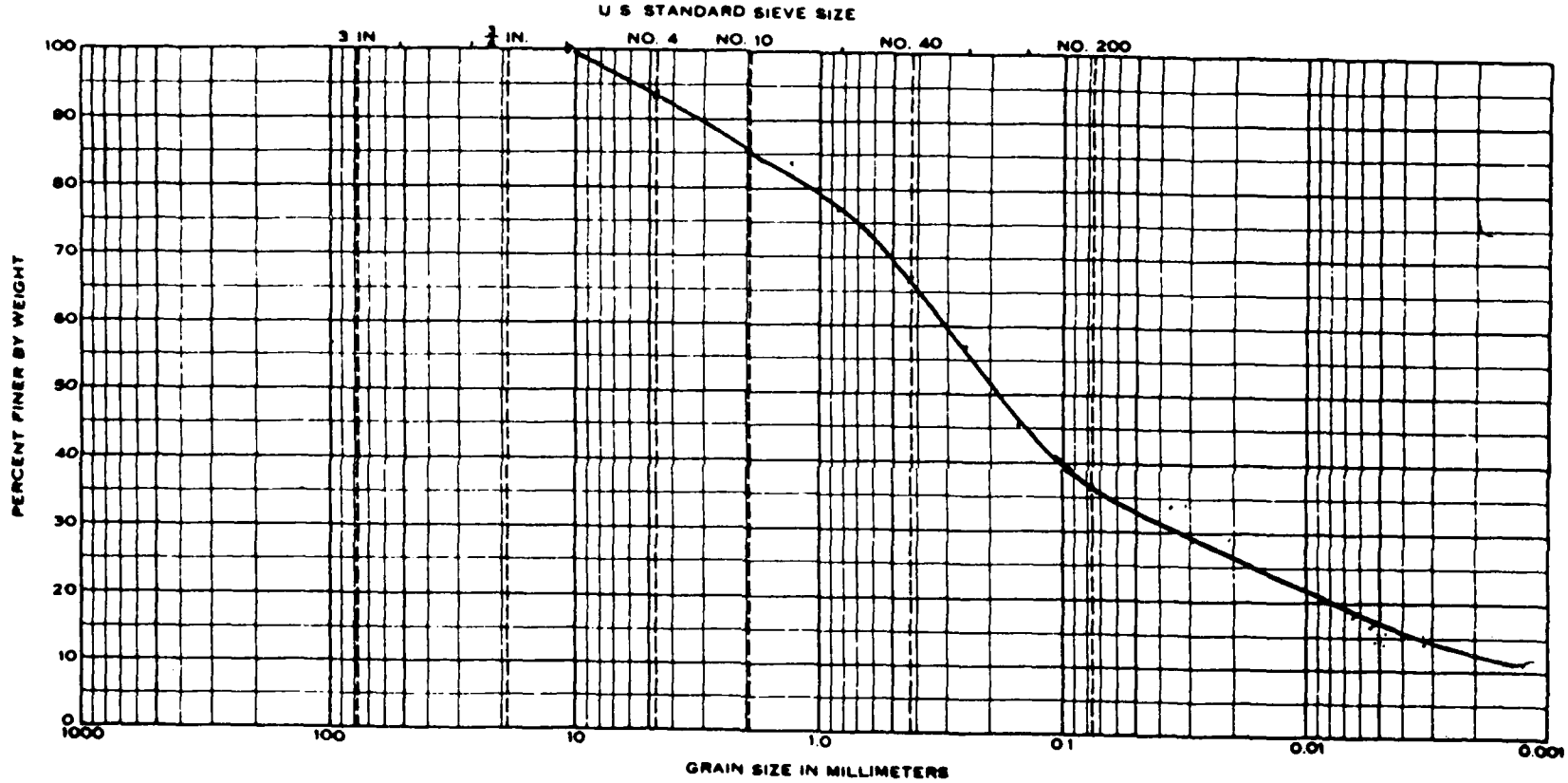
BORING NO. SW-9 SAMPLE NO. ST-1

DEPTH 15-17 MAT. DESCRIPTION SOIL TUBE

DATE 11-22-86 BY JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	10.70	93.794
NO. 10	13.40	85.425
NO. 20	13.20	77.177
NO. 40	18.30	67.357
NO. 60	22.70	57.567
NO. 100	14.30	46.370
NO. 200	19.50	37.522

DIAMETER, MM	PERCENT PASSING
.03393125	24.7713
.02027124	19.6605
.01209965	14.5941
.00870527	12.3499
.00627588	13.5573
.00321314	14.4171
.00133489	11.2249



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	
SW-9 ST-1	15-17	silty c-f SAND		18	13	5	

GRADATION CURVES

Project HART MAFB

Date NOV. 22 1986 JOB No. 86B125-01A

H.11-8

J & L TESTING COMPANY

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

PROJECT LOCATION MAFB

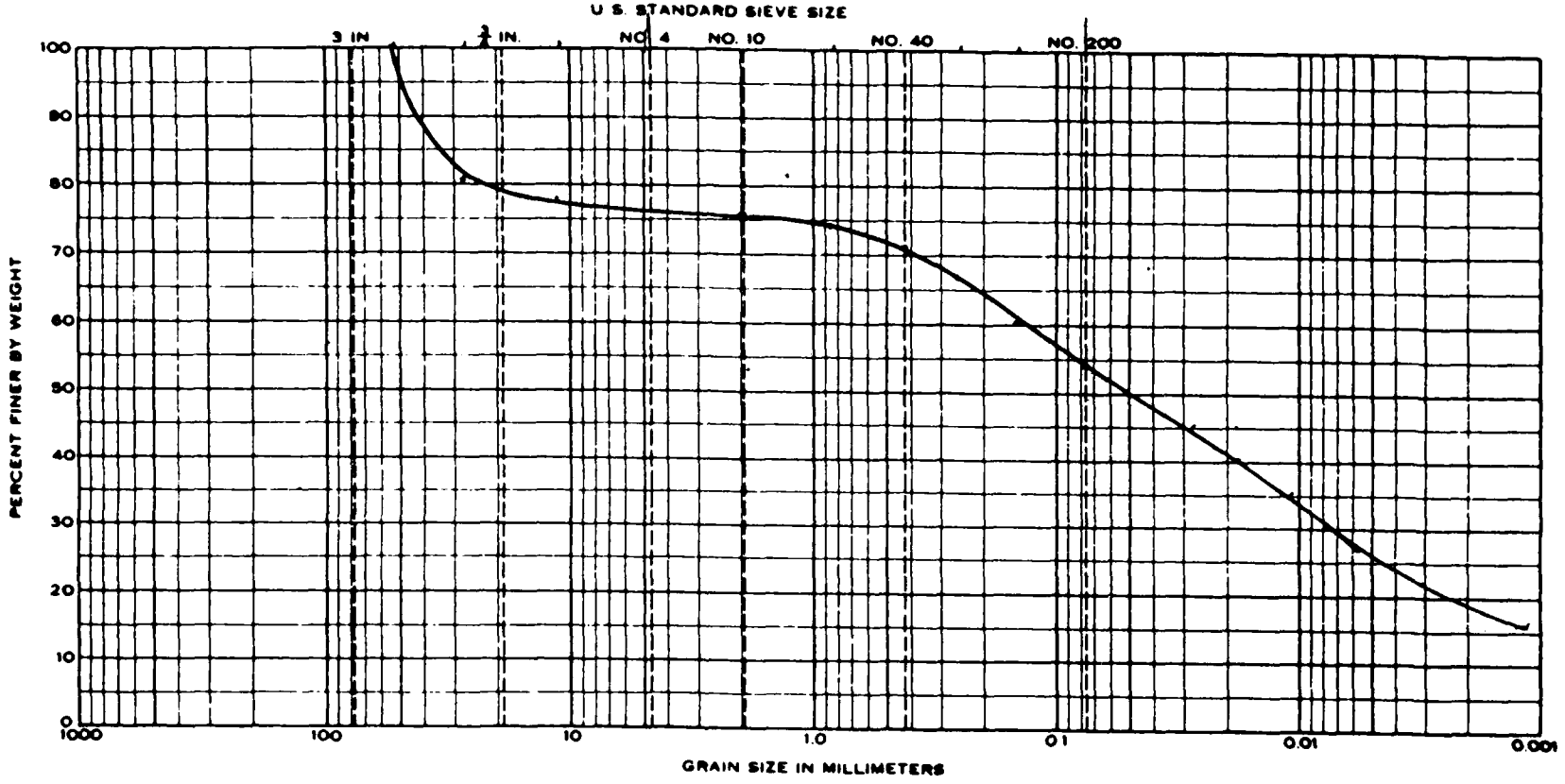
BORING NO. DW-1 SAMPLE NO. ST-1

DEPTH 46-48 MAT. DESCRIPTION SOIL

DATE 11-22-86 BY [illegible]

SIEVE SIZE	WT,GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	30.50	81.434
.75 INCH	.00	81.434
.50 INCH	11.10	78.911
NO. 4	2.10	73.405
NO. 10	5.50	75.911
NO. 20	13.00	74.515
NO. 40	11.60	71.480
NO. 50	13.50	67.140
NO. 100	13.50	58.590
NO. 200	29.30	54.231

DIAMETER(MM)	PERCENT PASSING
.02707742	45.8445
.01811150	40.1503
.01089715	35.1813
.00799642	31.3002
.00581135	17.4542
.00300633	12.3042
.00129135	10.7361



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI
DW-1 ST-1	46-48	Gravelly c-f sandy SILTY CLAY		34	17	17

GRADATION CURVES

Project HART MAFB

Date NOV. 22 1986 JOB No. 86B125-01A

H.11-10

J & L TESTING COMPANY

SUMMARY OF TRIAXIAL PERMEABILITY TEST RESULTS

CLIENT:HART
PROJECT LOCATION:MAFB
SAMPLE NO.:DW-2
DESCRIPTION:ST-1
14-16
TUBE

DATE:NOV 22 1986
JOB No.:868125-01A

CELL NO.:3 FLUID:DEAIRED B-Parameter:1.0

PHYSICAL PROPERTY DATA.....

INITIAL HEIGHT:	3.800	in	FINAL HEIGHT:	3.796	in
INITIAL DIAMETER:	2.8000	in	FINAL DIAMETER:	2.8000	in
INITIAL WET WEIGHT:	827.7	gm	FINAL WET WEIGHT:	829.8	gm
WET DENSITY =	134.6	pcf	WET DENSITY :	135.1	pcf
MOISTURE CONTENT:	17.9	%	MOISTURE CONTENT:	18.2	%
DRY DENSITY:	114.2	pcf	DRY DENSITY:	114.3	pcf
INITIAL SATURATION:	97.9	%	FINAL SATURATION:	99.9	%
INITIAL VOID RATIO:	.502655		FINAL VOID RATIO:	.501085	

TEST PARAMETERS.....

CELL PRESSURE:	50.00	.00	.00	.00	psi
HEAD WATER:	45.00	.00	.00	.00	psi
TAIL WATER:	39.00	.00	.00	.00	psi

PERMEABILITY INPUT DATA.....

FLOW (Q):	14.50	.00	.00	.00	cc
LENGTH (L):	3.80	.00	.00	.00	in
AREA (A):	6.16	.00	.00	.00	sqin
HEAD (h):	6.00	.00	.00	.00	psi
TIME (t):	300.00	.00	.00	.00	min

COMPUTED PERMEABILITY @ 20 degrees Centigrade.....

TEST NO. 1, k=	4.634E-007	cm/sec
TEST NO. 2, k=	.000E+000	cm/sec
TEST NO. 3, k=	.000E+000	cm/sec
TEST NO. 4, k=	.000E+000	cm/sec

BY _____ DATE _____
CHK'D _____ DATE _____

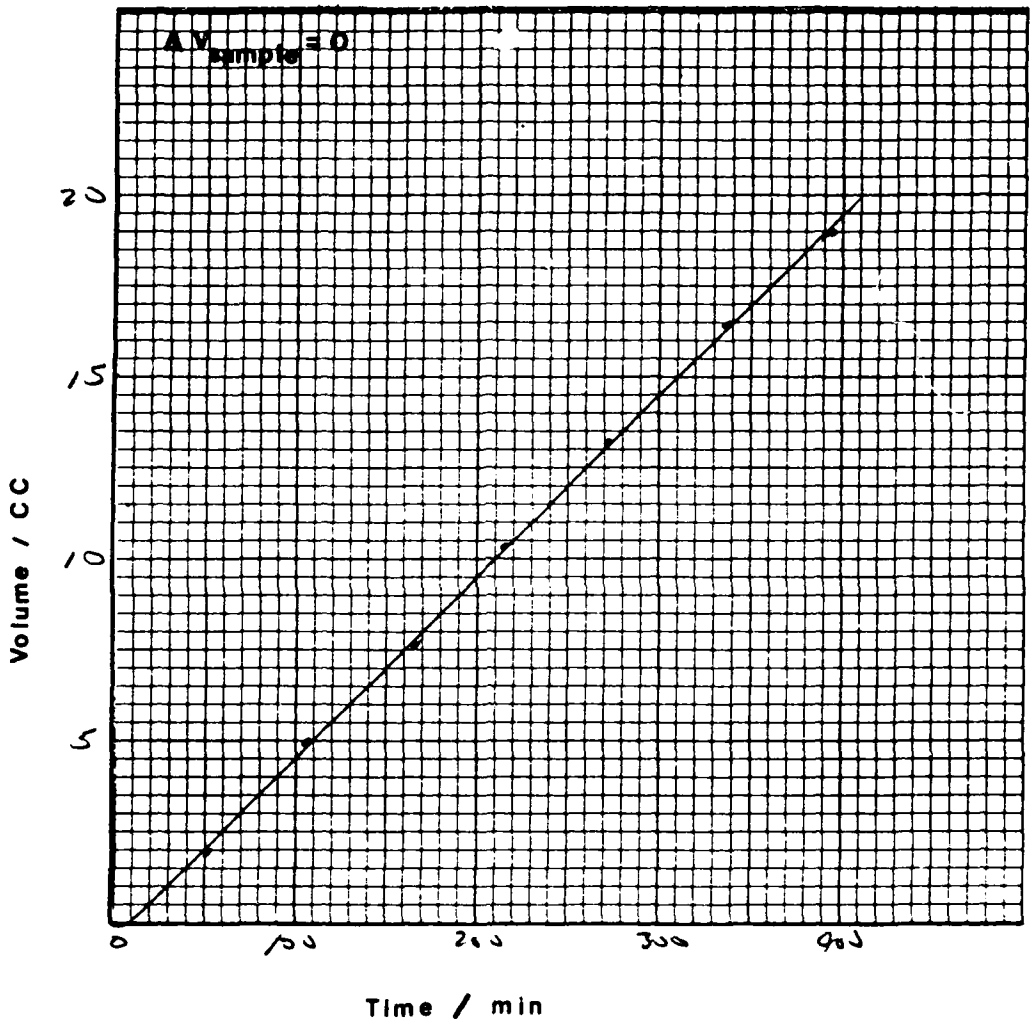
Geotechnical Testing

_____ OF _____ PAGE

SUBJECT DW-2 ST-1 14'-16' JOB NO. _____

$K = \frac{QL}{Aht}$

FLOW vs TIME



Q cc = 14.5

L in = 3.75

A ft^2 = 2.80 ϕ

h psi = 6

t sec = 18000

$k_{20°C}$ = 4.63 $\times 10^{-7}$ cm/sec

GRAIN SIZE ANALYSIS

PROJECT NAME HART JOB NO. 86B125-01A

PROJECT LOCATION MAFB

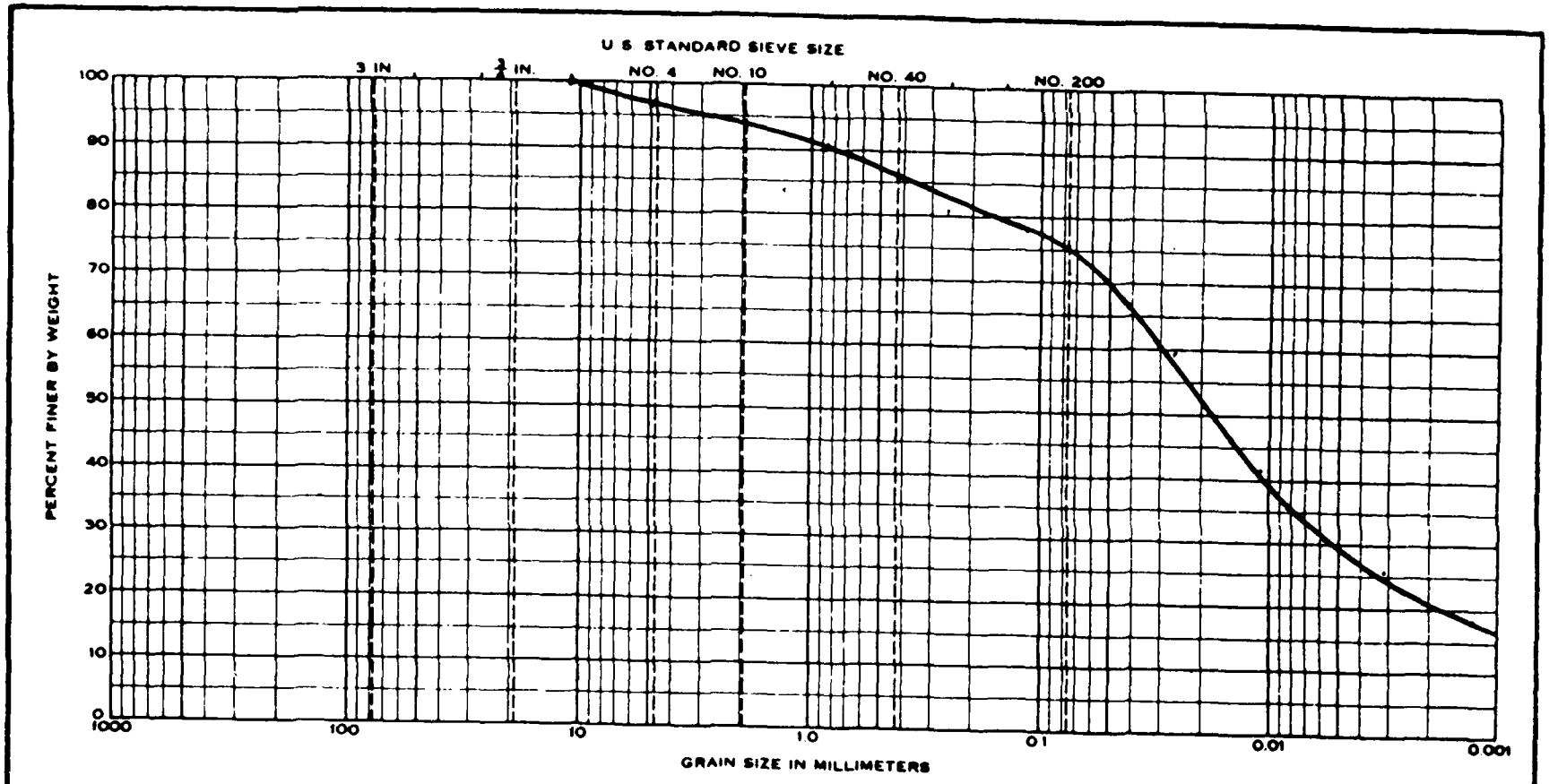
BORING NO. BW-2 SAMPLE NO. ST-1

DEPTH 14-16 MAT. DESCRIPTION SOIL TUBE

DATE 11-22-86 BY JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	4.70	97.384
NO. 10	5.20	94.490
NO. 20	5.00	91.151
NO. 40	3.10	86.514
NO. 60	10.30	80.912
NO. 100	3.00	79.242
NO. 200	5.30	76.353

DIAMETER (MM)	PERCENT PASSING
.0269713[illegible]	57.[illegible]
.0131111[illegible]	49.[illegible]
.0110311[illegible]	41.[illegible]
.0030995[illegible]	36.5804
.0058892[illegible]	31.3206
.0030608[illegible]	25.3249
.0013[illegible]	17.3213



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI
DW-2 ST-1	14-16	C-f Sandy SILTY CLAY		26	16	10

Project HART MAFB

GRADATION CURVES

Date NOV. 22 1986 JOB No. 86B125-01A

J & L TESTING COMPANY

SUMMARY OF TRIAXIAL PERMEABILITY TEST RESULTS

CLIENT:HART
PROJECT LOCATION:MAFB
SAMPLE NO.:DW-4
DESCRIPTION:ST-1
20-22 FEET
UD TUBE

DATE:NOV 22 1986
JOB No.:86B125-01A

CELL NO.:1 FLUID:DEAIRED B-Parameter:1.00

PHYSICAL PROPERTY DATA.....

INITIAL HEIGHT:	4.250	in	FINAL HEIGHT:	4.246	in
INITIAL DIAMETER:	2.8100	in	FINAL DIAMETER:	2.8100	in
INITIAL WET WEIGHT:	959.2	gm	FINAL WET WEIGHT:	960.8	gm
WET DENSITY =	138.5	pcf	WET DENSITY :	138.9	pcf
MOISTURE CONTENT:	16.7	%	MOISTURE CONTENT:	16.9	%
DRY DENSITY:	118.7	pcf	DRY DENSITY:	118.8	pcf
INITIAL SATURATION:	99.1	%	FINAL SATURATION:	100.5	%
INITIAL VOID RATIO:	.471999		FINAL VOID RATIO:	.470681	

TEST PARAMETERS.....

CELL PRESSURE:	50.00	.00	.00	.00	psi
HEAD WATER:	45.00	.00	.00	.00	psi
TAIL WATER:	39.00	.00	.00	.00	psi

PERMEABILITY INPUT DATA.....

FLOW (Q):	18.20	.00	.00	.00	cc
LENGTH (L):	4.25	.00	.00	.00	in
AREA (A):	6.20	.00	.00	.00	sqin
HEAD (h):	5.00	.00	.00	.00	psi
TIME (t):	300.00	.00	.00	.00	min

COMPUTED PERMEABILITY @ 20 degrees Centigrade.....

TEST NO. 1, k=	6.460E-007	cm/sec
TEST NO. 2, k=	.000E+000	cm/sec
TEST NO. 3, k=	.000E+000	cm/sec
TEST NO. 4, k=	.000E+000	cm/sec

BY _____ DATE _____
CHK'D _____ DATE _____

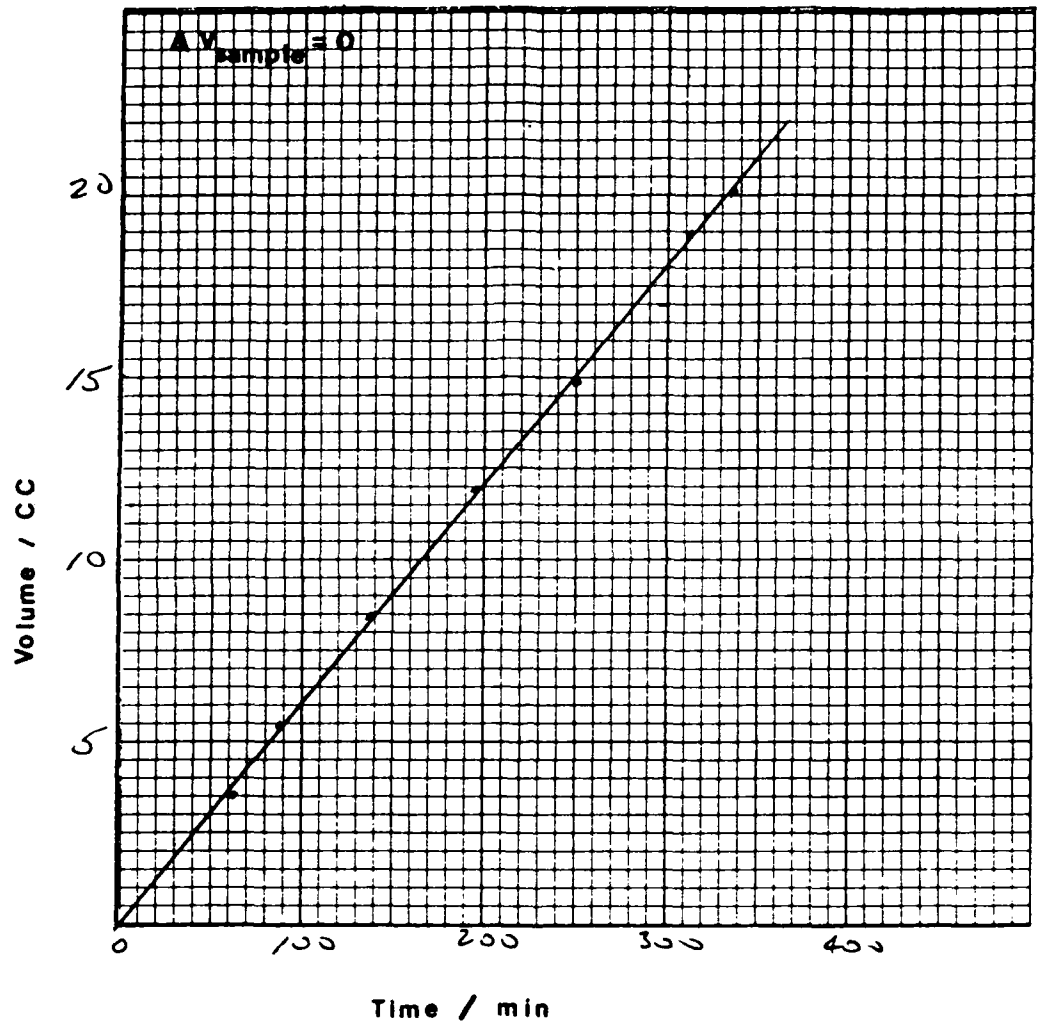
Geotechnical Testing

_____ OF _____ PAGE

SUBJECT DW-4 ST-1 2022 JOB NO. _____

$K = \frac{QL}{Aht}$

FLOW vs TIME



Q cc = 18.2

L in = 4.24

A ft² = .281 ϕ

h psi = 6

t sec = 1800

$k_{20°C}$ = _____ cm/sec

GRAIN SIZE ANALYSIS

PROJECT NAME: HART JOB NO. 96B125-01A

PROJECT LOCATION: MAFB...

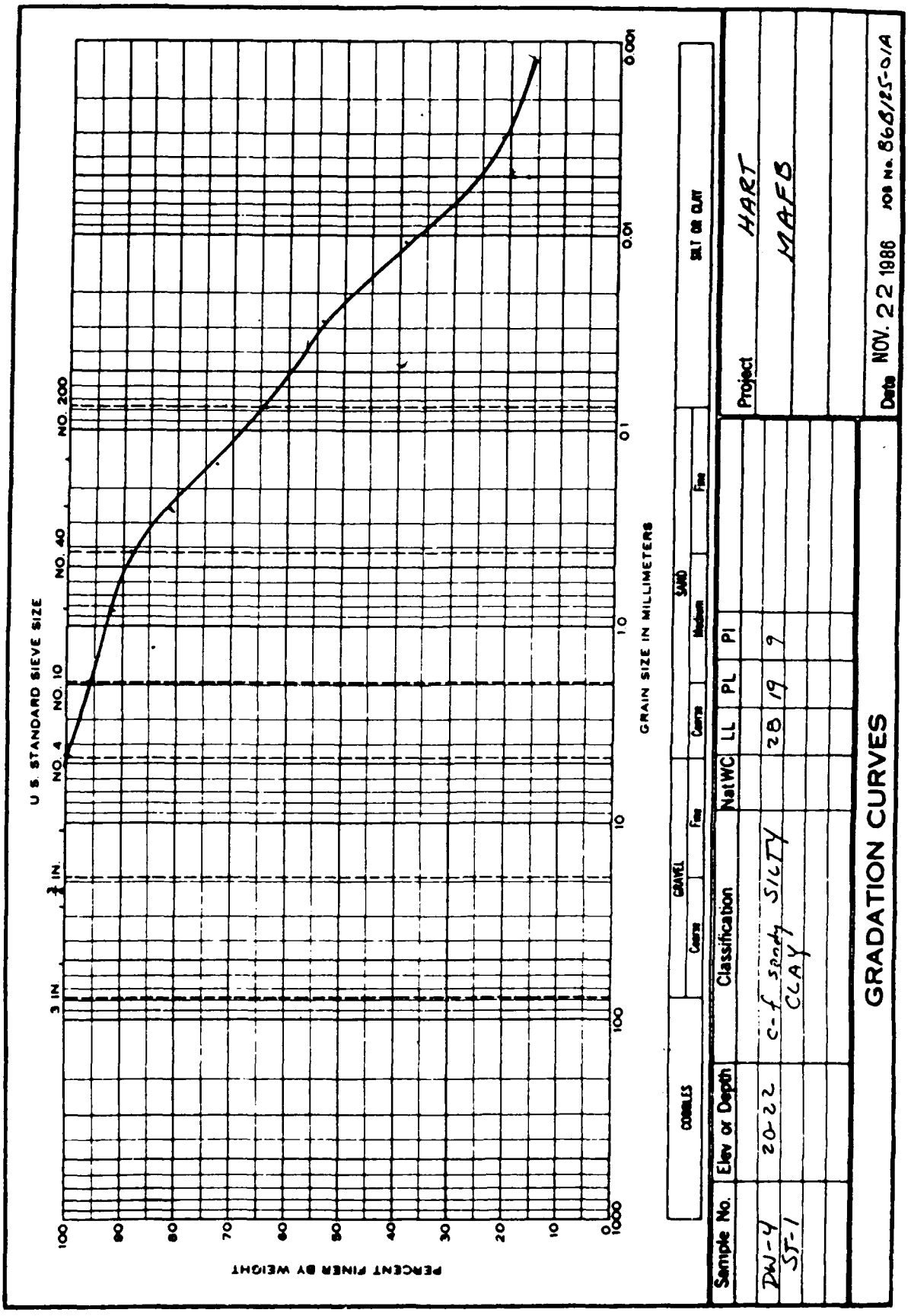
BORING NO. DW-4 SAMPLE NO. ST-1

DEPTH: 20-22 MAT. DESCRIPTION: SOIL TUBE

DATE: 11-22-96 BY: JB

SIEVE SIZE	WT.GMS	PERCENT PASSING
3 INCH	.00	100.000
2 INCH	.00	100.000
1 INCH	.00	100.000
.75 INCH	.00	100.000
.50 INCH	.00	100.000
NO. 4	.00	100.000
NO. 10	8.40	96.313
NO. 20	5.20	90.741
NO. 40	7.30	38.148
NO. 60	11.30	31.912
NO. 100	14.30	23.975
NO. 200	15.10	14.343

DIAMETER MM	PERCENT PASSING
.02[illegible]11	54.4949
.01360936	46.3465
.01139459	38.1991
.00807581	33.4613
.00581[illegible]	28.6315
.0031[illegible]794	21.3301
.00131574	15.2968


U.S. STANDARD SIEVE SIZE
3 IN
¾ IN.
NO. 4
NO. 10
NO. 40
NO. 200
GRAIN SIZE IN MILLIMETERS
PERCENT FINER BY WEIGHT
COBBLES
GRAVEL
Coarse
Fine
SAND
Coarse
Medium
Fine
SILT OR CLAY
Sample No.
Elev or Depth
Classification
Nat WC
LL
PL
PI
DW-4
SS-1
20-22
c-f sandy SILTY CLAY
28
19
9
Project
HART
MAFS
Date NOV. 22 1986
JOB No. 86/25-01A
GRADATION CURVES

APPENDIX I

CORRESPONDENCE WITH FEDERAL, STATE AND/OR LOCAL REGULATORY AGENCIES

(CL5060B/0528N)

I.1

NORTH DAKOTA
STATE DEPARTMENT OF HEALTH
State Capitol
Bismarck, North Dakota 58505

ENVIRONMENTAL HEALTH SECTION

1200 Missouri Avenue
Box 5520
Bismarck, North Dakota 58502-5520

RE: MINOT AIR FORCE BASE SW-247
MINOT AIR FORCE BASE HW-021

October 25, 1985

John L. Boucher
Environmental Coordinator
Minot Air Force Base
91st CSG
Minot AFB, ND 58705

SUBJECT: REVIEW OF PHASE I IRP REPORT AND PROPOSED MONITORING WELL INSTALLATION

Dear Mr. Boucher:

Our office has reviewed the Phase I Installation Restoration Program (IRP) Report prepared for the Minot Air Force Base. Some comments applicable to the monitoring of the Minot Air Force Base landfill ("HW-021") are enclosed.

The memo suggests that there may be groundwater flow in a drainageway traversing the landfill site. The memo points out that additional well clusters installed in the drainageway would help to monitor any leachate flow into and through this low-lying area. Such drainageways often act as groundwater conduits.

The Department appreciates the opportunity to review the Phase I report and we would appreciate being kept informed of any progress and any developments during the Phase II study. Should you have any questions regarding this matter or need any further information, please feel free to contact Mr. Steven Tillotson of our staff.

Sincerely,

Marlin R. Schock, Director
Division of Hazardous Waste
Management and Special Studies

MRS:ST:sm
Enc. as noted

NORTH DAKOTA STAT I.2 RTMENT OF HEALTH

TRADEPARTMENTAL MEMORANDUM

Date

Subject

RE: MINOT AIR FORCE BASE SW-247

TO: MARTIN R. SCHOCK

FROM: STEVEN J. TILLOTSON S.J.T.

SUBJECT: REVIEW OF PHASE I DOCUMENT FOR THE MINOT AIR FORCE BASE INSTALLATION RESTORATION PROGRAM (IRP)

DATE: OCTOBER 25, 1985

The Department recently received a copy of the Phase I study of the Installation Restoration Program for the Minot Air Force Base., This Phase I study includes a records search and proposes some groundwater monitoring installations around the Minot Air Force Base landfill permitted in the NW 1/4 of the NE 1/4 of Section 11, TWP 157, R 83 as Permit SW-247.

The records search indicated portions of the landfill were used for disposal of tank cleaning sludges, oils, solvents (including chlorinated solvents), MEK, paints, stripper, and thinners.

Some borings and monitoring wells at the site indicate the area is underlain by a fractured till with some lenses of sand and gravel. The water table at the site ranges from near surface to approximately 18 feet below land surface. Leachates from nearby sewage lagoons are probably contributing to the high water table conditions. The site is dissected by a northwest to southeast trending drainageway which flows into a nearby intermittent stream. Maps available from the County Groundwater Study indicate the small drainageway and the intermittent stream are underlain by sand and gravel deposits which make up a small aquifer.

The Phase I study proposes that the landfill site be furtner monitored with a surface water monitoring program and six clusters of monitoring wells to be installed around the perimeter of the site. The screened intervals for the clusters would include some wells screened at and near the water table to monitor for floating contaminants such as petroleum products. The six clusters would include one cluster to be constructed within the drainageway leading off-site.

It appears that the proposed six clusters of wells will be helpful in determining local hydrology, however, some thought should be given to additional well installations along and in the northwest-southeast trending drainageway. While the regional flow pattern for groundwater appears to be to the northeast, there may be significant flow along the drainageway which could act as a conduit. Therefore, it is advisable that additional clusters of monitoring wells be installed as follows (see attached map):

1. One cluster of wells should be installed along the north portion of the site where the property boundary intersects the drainageway. This well may act as an upgradient well for flow through the drainageway (see Site A on attached map).

2. Another one or two clusters of wells should be installed in the interior portion of the landfill along the drainageway (see attached map for Sites B and C). This would help monitor for lateral flow of leachates into the ravine.

3. Finally, the report shows the location of a well cluster in the drainageway along the eastern perimeter of the site. This well cluster appears to be well located (see Site D).

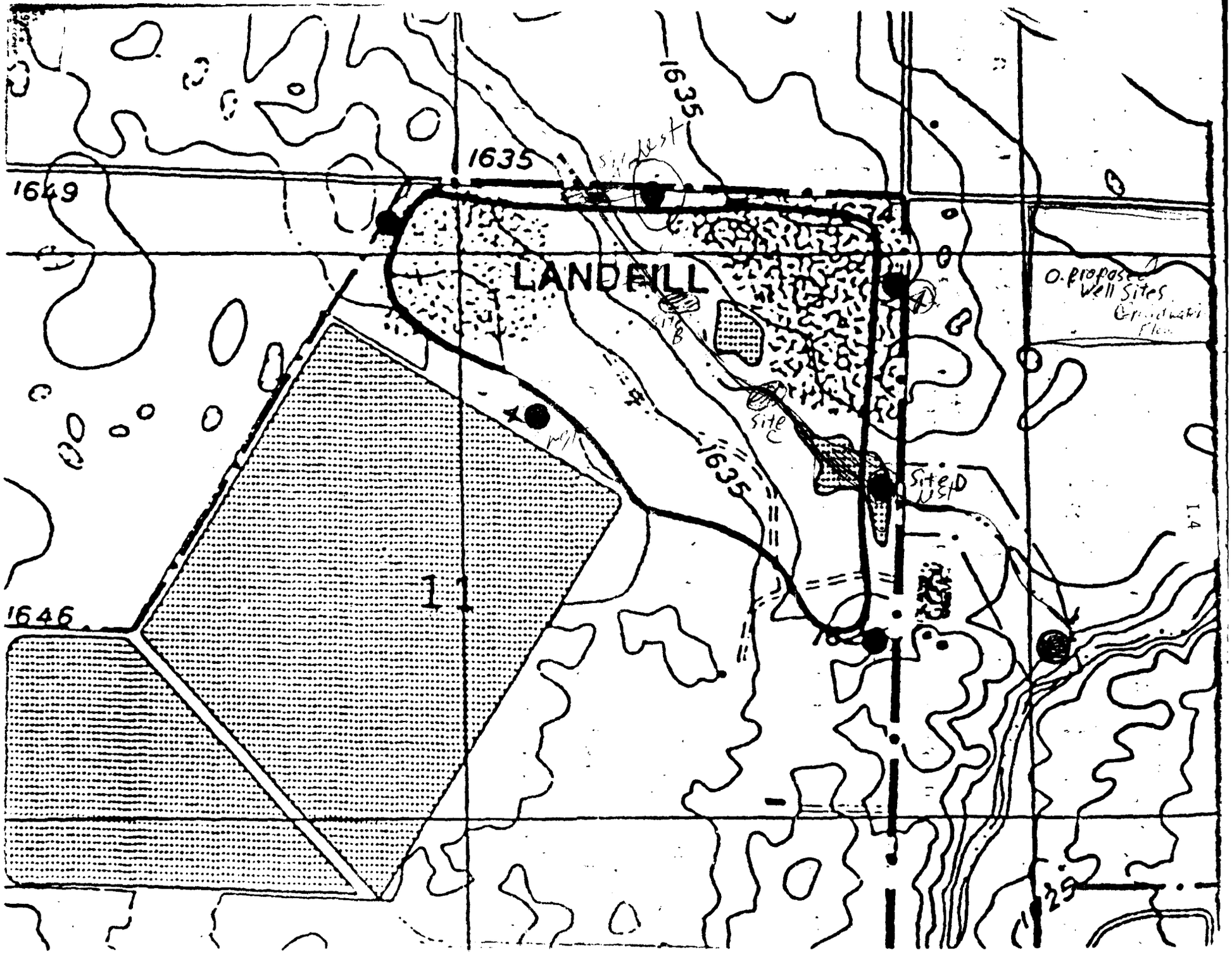
The placement of these additional wells along the drainageway would help monitor for near surface groundwater flow which often follows surficial land contours.

The remainder of the Phase I report appears to be well prepared and the construction details for the monitoring wells appears to be very adequate. It would be helpful for the Department to be kept informed of the progress during the Phase II portions of the study.

SJT:km

Proposal

1971


1635
1649
LANDFILL
1635
1635
1646
11
Site B
Site C
Site D
West
O. Proposed Well Sites
Groundwater Flow
I-4
25

APPENDIX J

REFERENCES

REFERENCES

1) Bluemle, J.P., Personal Communication; North Dakota Geological Survey, November, 1986.

2) Bluemle, J.P., Geology of McLean County, North Dakota; North Dakota Geological Survey Bulletin 60, Part 1 North Dakota State Water Commission County Ground Water Study 19, Bismark, North Dakota, 65p, 1971.

3) Bluemle, J.P., The Face of North Dakota, The Geological Story; North Dakota Geological Survey, Educational Series 11, 1977.

4) Bluemle, J.P., Guide to the Geology of Northwestern North Dakota; North Dakota Geological Survey, Educational Series 8, 1980.

5) Clayton, Lee, et al., Geologic Map of North Dakota; U.S. Geological Survey, 1980.

6) Comeskey, A.E. and Reiten, J., Ground Water Resources of the Surry Area Ward County, North Dakota; North Dakota State Water Commission County Ground Water Study Number 87, Bismark, North Dakota 1982.

7) Environmental Science and Engineering, Inc., Installation Restoration Program Phase I: Records Search, Minot Air Force Base, North Dakota; Denver, Colorado, December, 1984.

8) Fetter, Jr., C.W., Applied Hydrogeology; Charles E. Merrill Publishing Company, Columbus, Ohio 43216, 1980.

9) Freeze, P.A. and Cherry, J.A., Groundwater; Prentice-Hall, Inc., Englewood Cliffs, New Jersey 07632, 1979.

10) Hansen, D.E. and Kume, J., Geology and Ground Water Resources of Grand Forks County; Part I: Geology; North Dakota Geological Survey Bulletin 53, North Dakota State Water Commission County Ground Water Study 13, Bismark, North Dakota, 1970.

11) Jensen, H.M., Geology and Occurrence of Ground Water Near Bowbells, Burke and Ward Counties, North Dakota; North Dakota State Water Commission County Ground Water Study Number 42, Bismark, North Dakota, 1962.

(CL5061B/0536N)

12) Kehew, A.E., Geology and Geotechnical Conditions of the Minot Area, North Dakota; North Dakota Geological Survey Report of Investigation Number 73, 1983.

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17) Pettyjohn, W.A. and Hills, D.L., Geohydrology of the Souris River Valley in the Vicinity of Minot, North Dakota; North Dakota State Water Commission County Ground Water Study Number 65, Bismark, North Dakota, 1965.

18) Pettyjohn, W.A. and Hutchinson, R.D., Ground Water Resources of Renville and Ward Counties; North Dakota Geological Survey Bulletin 50, Parts I, II and III, North Dakota State Water Commission, Bismark, North Dakota, 1971.

19) Powers, P.J., Construction Dewatering; John Wiley & Sons, New York, 1981.

20) Sax, N.I., Dangerous Properties of Industrial Materials, 6th Edition, 1984.

21) Schmid, R.W., Ground Water in the Vicinity of Ryder, Ward County, North Dakota; North Dakota State Water Commission, Bismark, North Dakota, 1963.

22) Shields, E.J., Pollution Control Engineer's Handbook; Pudvan Publishing Co., Northbrook, Illinois 60062, 1985.

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23) United States Environmental Protection Agency, National Interim Primary Drinking Water Standards; Title 40, Code of Federal Regulations 141.

24) United States Environmental Protection Agency, National Secondary Drinking Water Standards; Title 40, Code of Federal Regulations 143.

25) United States Environmental Protection Agency, Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater; Title 49, Code of Federal Regulations 43250.

26) United States Environmental Protection Agency, Ambient Water Quality Criteria; Federal Register, Vol. 45, No. 231, November 28, 1980.

27) United States Environmental Protection Agency, Suggested No Adverse Response Levels; EPA Vol. 3, No. 17, April 30, 1982

28) United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, Hazardous Waste Land Treatment; SW-874, pg. 273, Table 6.46, April, 1983.

29) United States Environmental Protection Agency, Land Disposal Branch, Preliminary Protective Concentration Limits; Internal Memo, Attachment 1, August 13, 1984.

30) United States Environmental Protection Agency, Laboratory Data Validation: Functional Guidelines for Evaluating Organic Analyses; TDD No. HQ-8410-01, Hazardous Site Control Division, Washington, D.C., 1985.

31) United States Environmental Protection Agency, Laboratory Data Validation: Functional Guidelines for Evaluating Inorganic Analyses; TDD No. HQ-8410-01, Hazardous Site Control Division, Washington, D.C., 1985.

32) United States Environmental Protection Agency, Test Methods for Evaluating Solid Waste (SW-846), Sept. 1986.

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(CL5061B/0536N)

APPENDIX K

BIOGRAPHIES OF KEY PERSONNEL

(CL5060B/0528N)

James P. Mack

Fields of Competence

Geology; hydrogeology; water resources evaluation; groundwater monitoring programs; geophysical surveys; groundwater characterization; environmental impact statements and permits; groundwater remediation.

Experience Summary

Thirteen years of hydrogeological experience including design of groundwater monitoring systems, hazardous waste site investigations, application of hazard ranking models, preparation of RCRA compliance plans, including monitoring, maintenance and contingency plans, and spill response plans.

Education

B.S., Geology, Waynesburg College, 1974

M.S., Geology, Adelphi University, 1980

Key Projects

- Manager of Geosciences Department, consisting of approximately 60 professionals located in nine offices throughout the U.S.

- Conducted and supervised Phase II confirmation studies for the Air Force's Installation Restoration Program (IRP). This involved developing scopes of work, estimating costs, coordinating subcontractors, supervising field work, preparing draft and final reports, and attending meetings.

- Participated in several Initial Assessment Studies (IASs) for the U.S. Navy. Prepared water resources, soils and geology sections for IASs for the Indian Head Naval Ordnance Station, Earl Naval Weapons Station, Patuxent River Naval Air Station, Mechanicsburg Ships Parts Control Center and the Davisville Construction Battalion Center. Collected available published and filed reports, conducted interviews with appropriate personnel, evaluated potential groundwater and surface water impacts from identified disposal areas, and ranked designated sites according to the Navy ranking model.

- Conducted hydrogeologic investigations of landfills and soil contamination problems in Ohio, West Virginia, Connecticut, New Jersey, New York, New Mexico, Maryland, Alabama and North Dakota.

- Participated in the design of a groundwater monitoring system for a major hazardous waste disposal site near Niagara Falls, New York. Because of the unique characteristics of the hydrogeologic environment, a new design was developed for monitoring wells.

- Conducted extensive hydrogeologic field investigations at a hazardous waste disposal site near Baltimore, Maryland, including drilling of test borings, installation of monitoring wells, natural gamma logging, aquifer tests, groundwater flow analysis and an estimate of potential impacts.

- Project Manager for a site investigation and remedial design at a location in Toledo, Ohio, where excessive chromium contamination had been discovered in low permeable clay soil. Work consisted of the construction of 9 test pits, approximately 40 test borings and collection of over 300 soil samples which were analyzed for total chromium, hexavalent chromium, EP Toxic chromium. Remedial option considered consisted of soil excavation, capping, monitoring and an area of limited use.

- Conducted RCRA compliance and environmental liability audits at various manufacturing and disposal facilities, including plating operations, automobile manufacturing plants and hazardous waste TSD facilities.

- Managed two ECRA sites for a major maufacturer. Sites contained metal and solvent contamination.

- Provided technical input for at least ten ECRA sites for various clients. Work consisted of negotiations with ECRA, preparing sampling plans, coordinating field sampling activities and preparing cleanup plans.

- Prepared a draft Corrective Actions Permit Writers Manual for EPA. Manual specified techniques EPA permit writer could use to evaluate the effectiveness of proposed groundwater cleanup programs.

- Prepared an off-site spill response plan for a hazardous waste processing facility near Chicago, Illinois. Included coordinating site personnel, contacting local emergency response agencies and establishing a sequence of procedures for corporate personnel in the event of a spill.

- Prepared earth and water resources sections for major environmental impact statements on 201 Facilities Plans for large river basins in the Northeast and Puerto Rico. This work included an evaluation of the potential effects expanded suburban development may have on regional groundwater quality and quantity. Characterized existing hydrogeologic conditions, prepared hydrologic budgets, delineated productive aquifers, performed safe yield determinations, and identified aquifer recharge areas.

- Performed a hydrogeological analysis of a proposed hazardous waste disposal site (for PCBs) in the Upper Hudson region of New York. This included an evaluation of the site for compliance with New York State and Federal Hazardous Waste Disposal Regulations, suitability of the leachate collection system, and adequacy of the groundwater monitoring plan.

Professional Affiliations

National Well Water Association

Publications

Mr. Mack prepared Earth & Water Resources sections for the following studies:

- Environmental Impact Statement on the 201 Facilities Plan for the Upper Passaic River Basin in New Jersey.
- Environmental Impact Statement on the 201 Facilities Plan for the Upper Rockaway River Basin, New Jersey.
- Environmental Impact Statement on the 201 Facilities Plan for the Lajas Valley in Puerto Rico.
- Environmental Impact Statement on the 201 Facilities Plan for the Upper Hudson-Lake George Region in New York.
- Environmental Impact Statement on the Dredging and Upland Disposal of PCB-Laden River Bed Sediments in the Upper Hudson, Fort Edwards, New York.

"Potential Groundwater Contamination from Development at Various Densities at Elwood, New York." Town of Huntington, Department of Environmental Protection, Huntington, New York.

"Environmental Impact Statement on the Imperial Gardens Subdivision With Special Reference to Anticipated Groundwater Contamination, Commack, New York." Town of Huntington, Department of Environmental Protection, Huntington, New York.

"Monitoring, Maintenance and Contingency Plan for SCA Chemical Services, Inc., Model City, New York."

"Off-Site Spill Emergency Response Plan for SCA Chemical Services Chicago Facility."

"Phase I Field Investigations and Risk Assessment of the Solley Road Site."

Hydrogeology Assessment of the Laurel Park Landfill, Naugatuck, CT.

IAS Study, Naval Ordnance Station, Indian Head, Maryland.

IAS Study, Naval Weapons Station, Earl, New Jersey.

IAS Study, Naval Air Station, Patuxent River, Maryland.

IAS Study, Ships Parts Control Center, Mechanicsburg, Pennsylvania.

IAS Study, Construction Battalion Center, Davisville, Rhode Island.

Development of a Comprehensive Groundwater Monitoring System to Meet Federal and State Requirements.

Evaluating RCRA Corrective Actions Program.

Investigation and Corrective Action: How It Was Done at a Superfund Site in Connecticut.

"Equipment for Data Collection at Hazardous Wastes Sites - An Overview for Environmental Professionals" (with T.J. Morahan) in The Proceedings of the National Conference on Hazardous Wastes and Hazardous Materials, March 1986.

Robert D. Goldman, CPGS

Registration

Certified Professional Geological Scientist (CPGS) No. 7293. Certified Professional Geologist in State of Indiana.

Fields of Competence

Hydrogeological investigations for groundwater contamination, soil and groundwater sampling, preparation of RI/FS work plans, groundwater modeling, geophysical exploration for oil and gas and well-site geology.

Experience Summary

Seven years varied geologic, hydrogeologic, and geophysical experience, including hazardous waste site investigations involving development and installation of groundwater monitoring programs, geophysical applications and processing and well-site geology.

Education

B.A., Geology, University of Colorado, Boulder, 1979
Additional courses at University of Lancaster, England, Adelphi University, Garden City, New York and University of Colorado, Denver.

Key Projects

- Project Manager of two USAF Phase II Installation Restoration Program projects at a Strategic Air Command Base and an Air Force plant. Work included preparation of Technical Operations Plan, Health and Safety Plan, supervision of field work, development of groundwater monitoring program, Remedial Investigation report.

- Manager of field operations at a CERCLA site for the Remedial Investigation of a lead and cadmium contamination problem from mine tailings in Aspen, Colorado. Study included soil sampling, test pit and borehole investigation, soils mapping and surface water budget study.

- Investigations of several abandoned industrial sites in Pennsylvania and New York involving the sampling of soils for PCBs and TPH for real estate transactions.

- Site visit and evaluation of soils and groundwater investigations at a pharmaceutical manufacturer in Sao Paulo, Brazil.

- Auditing of two commercial low-level radioactive waste landfills in Washington and Nevada. Work involved analysis of the environmental monitoring systems including the groundwater, surface water, air, soil and vegetation.

- Field Team Leader including coordination of four companies on CERCLA site in Tampa, Florida involving installation of 14 monitoring wells, sampling of monitoring wells and residential wells, surface water and soil sampling.

- Assistant Project Manager and field team leader at Michigan CERLCA site; responsible for groundwater sampling, monitoring well installation, installation and maintenance of long-term monitoring and supervision of general field activities.

- Responsible for three-dimensional modeling of the groundwater flow at a Michigan CERCLA site to design remedial activities, utilizing USGS 3D Finite Difference model.

- Assistant Project Manager for two NURE (National Uranium Resource Evaluation) contracts in the Mississippi Embayment. Work involved extensive research and field sampling of the groundwater and surface water distribution with emphasis on hydrochemical trends for mineral exploration.

- Participated in the preparation of RCRA Part B permit applications for various facilities, including a land treatment facility and a sanitary landfill.

- Installation of groundwater monitoring well system in Puerto Rico in compliance with RCRA guidelines for Part B permit.

- Preparation of model to rank the degree of remedial action needed for 37 hazardous waste sites.

- Project geologist for numerous hydrogeologic investigations to monitor release of hydrocarbons from underground tanks.

- Interpreted seismic data in geologically complex onshore areas, including the Overthrust Belt, Paradox Basin and the Great Basin.

- Project geologist for Devonian shale degasification study in western New York. Responsible for site investigation, development of a drilling program and drilling prognoses of 15 wells.

Professional Associations

American Institute of Professional Geologists
Association of Groundwater Scientists and Engineers (National Well Water Association)

Technical Presentation

Gustavson, J.B. and Goldman, R.D., 1980. A Hydrogeochemical Method for Uranium Exploration in the Mississippi Embayment, Society of Mining Engineers of AIME Fall Meeting October 22-24, 1980, Minneapolis, Minnesota.

Jill F. Greenberg

Fields of Competence

Toxicology of environmental and occupational contaminants; industrial hygiene/health and safety procedures; solid waste, hazardous waste and hazardous materials management; receptor analysis; risk assessment and risk management; data collection and quality assurance/quality control procedures; environmental compliance audits.

Experience Summary

Seven years of experience in reviewing, assessing and disseminating to the public and private sectors information on chemical substances regarding their chemical properties and toxicity; evaluation of epidemiologic data on animal and human carcinogens; preparation of public outreach programs; site investigation and development of remedial action plans for hazardous waste sites.

Education

B.S., Biological Sciences, State University of New York-Binghamton, 1977
M.P.H. Candidate, Environmental Sciences, Columbia University School of Public Health
Certificate, New York University Summer Institute in Risk Management in Environmental Health and Protection, June 1986.

Key Projects

- Project Manager for quantitative RI/FS Endangerment Assessments (EA) of a landfill with mercury contamination in Puerto Rico and four asbestos disposal sites in New Jersey. Responsibilities included project plan preparation and revision and final report preparation.

- Project Manager for a quantitative human health risk assessment involving storage and burning of hazardous waste fuels at the Blue Circle Atlantic cement plant in New York State.

- Project Manager for a risk assessment for a USAF Phase II Installation Restoration project at a former Air Force plant in New Mexico. Responsibilities included development of appropriate or applicable and relevant requirements (ARARs), cost estimation, project plan preparation and revision, and final risk assessment report preparation.

- Project Manager for a potential property acquisition of a former auto parts manufacturing facility by a major appliance manufacturer. Responsibilities included preparation of a quantitative risk assessment and toxicological assessment and review of project team work products.

- Developed portions of a multiple-pathway dioxin risk assessment of municipal solid waste incineration emissions for Connecticut Department of Health Services.

- Provided technical support to the PRP committees for the Liquid Disposal Inc. Superfund site and the Rose Township Demode Road Superfund site in Michigan. Project has included review and critique of regulatory agency subcontractor reports and work products, and preparation of documents for negotiations with Region V. Also responsible for preparation of quantitative endangerment assessments for potential litigation.

- Project Manager for Army Corps of Engineers - sponsored quantitative risk assessment for the Winchester Tire Fire Superfund site in Virginia. Responsibilities included preparation of project plan and final report, and coordination and meetings with EPA Region III, the Corps of Engineers and other regulatory officials.

- Project Manager on a New Jersey ECRA case for a manufacturing facility owned by a Fortune 100 company. Responsible for development of project sampling plans, ECRA Form I (GIS) and Form II (SES) submission, negotiations with NJDEP, and implementation of project work plan.

- Managed and coauthored an OSHA hazard communication training videotape for a non-manufacturing office products supplier/marketer with over 60 sales and service centers nationwide. Also responsible for preparation and filing of RCRA permits for small quantity generator status. Project includes ongoing regulatory and technical support in all areas of environmental compliance.

- Responsible for the development and modification of final and interim status operating permits for the SCA Chemical Services, Inc., Model City facility. Revised the closure and post-closure plan, closure cost estimates, personnel training plan, Part A hazardous waste permit application, and the monitor- ing, maintenance and contingency plan to meet RCRA and state requirements for container and bulk storage, tank operations, wastewater treatment, PCB storage, solvent recovery and secure landfills.

- Performed a technical review of the Record of Decision for the PRP committee of the McAdoo Associates Superfund site. Evaluated the validity of water quality criteria/maximum acceptable contaminant levels proposed by EPA for 23 organic compounds detected on-site and prepared a critique of risk assessment assumptions utilized by EPA in the ROD.

- Responsible for the preparation and development of a guidance document on hazardous materials management for the fixed base operator/air taxi industry. Environmental compliance management areas covered included operational and procedural guidelines for storage and handling of flammable/combustible liquids, acids and compressed gases, hazardous substance release reporting and federal, state and local hazard communication/right-to-know legislation.

- Conducted an environmental compliance audit and risk assessment of hazardous waste management facilities used by a Fortune 100 chemical company. Used quantitative ranking to define corporate liability under RCRA and CERCLA.

- Assisted in the development of an EPA Part B Permit Writer's Guidance Manual for Hazardous Waste Storage Tanks. Work included development of sections pertaining to operating procedures for tank systems that store or treat ignitable, reactive or incompatible wastes.

- Preparation of an Endangerment Assessment (EA) for a USAF Phase II IRP Superfund site in New Mexico where numerous volatile organics and heavy metals (i.e. chromium) were detected in soil and groundwater. Work included development of aquatic, soil and airborne contaminant source-pathway-receptor analyses and an evaluation of laboratory QA/QC and reliability of analytical results. Also responsible for preparation of an EA for a USAF plant in New York State.

- Prepared an Endangerment Assessment for a Superfund site located in Delaware. Detailed toxicity profiles were developed for substances of concern, such as chromium, cadmium and ethylbenzene, and included identification of acute and chronic health risks and aquatic fate processes. Also developed an extensive groundwater/surface water sampling plan for the long-term monitoring program required by the remedial action workplan.

- Developed a hazard ranking system based on waste characteristics values for 22 organic and 18 inorganic compounds detected at 14 hazardous waste disposal sites of a Fortune 50 corporation in order to fulfill the requirements for an environmental liability audit. Substances of concern included heavy metals (chromium, lead), asbestos, inorganic acids, herbicides and organochlorine, organophosphate and carbamate insecticides.

- Developed the personnel training plan for the RCRA Part B permit application of a major New Jersey pharmaceutical manufacturing firm.

- Responsible for the classification and preparation of inventories on chemicals used in the semi-conductor industry, for compliance purposes under the OSHA Hazard Communication Standard and right-to-know training programs.

- Assisted in the development of RCRA Part B applications for the aqueous waste treatment and container storage facilities of a major automobile manufacturer in St. Louis, Missouri. Work included development of procedures to prevent hazards and an exposure assessment report for the regulated units at the facility.

- Assisted in a study of chemical exposures in the auto repair industry in the greater Metropolitan New York area. Developed a comprehensive manual for educational purposes.

- Completion of a nationwide review of state and local regulations pertaining to access to data on chemical composition and hazardous materials.

- Served as an editor and writer for a national health publication, which focused on critical issues in the area of environmental and occupational health, with analyses of its effect on health policy.

- Aided in the preparation of reports for public dissemination concerning availability of epidemiologic data on humans exposed to animal carcinogens and other toxic substances, such as arsenic, 1,3-butadiene and ethylene dibromide.

- Developed an extensive plan of remedial action for homeowners concerned about health effects from exposure to chlordane and Dursban, pesticides used by commercial applicators for termite eradication.

- Coordinator and moderator of a seminar series for community organizations that provided scientific and technical information in areas of environmental and health policy. Responsible for overall evaluation of project, preparation of proceedings for publication and community outreach.

- Aided in the design and development of a new research technique and methodology for integrated pest management using the enzyme-linked immunosorbent assay.

Professional Affiliations

American Public Health Association
Graduate Women in Science (AAAS)
Society for Risk Analysis - New York Chapter

Publications

"Installation Restoration Program. Phase II - Confirmation/Quantification Stage I. Final Report for United States Air Force Plant No. 59, Johnson City, New York." March 1988. Prepared for Headquarters Air Force Systems Command Aeronautical Systems Division/Facilities Management (ASD/PMDA) and United States Air Force Occupational and Environmental Health Laboratory (USAFOEHL).

Karstadt, M. and Greenberg, J., "Access to Data on Chemical Composition of Products Used in Auto Repair and Body Shops." Resurvey of Product Marketers (1988) (in preparation).

Karstadt, M. and Greenberg, J., "Access to Data on Chemical Composition of Products Used in Workplaces: Impact of the New York State Worker Right to Know Law (1988)" (in preparation).

"Multiple-Pathway Human Exposure and Health Risk Assessment of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzo-Furans from Municipal Solid Waste Incinerators". February 1987. Prepared for the State of Connecticut Department of Health Services.

Greenberg, J., AirTran News, National Air Transportation Association, September 1986. Environmental Spotlight Column: "FBOs: Storing Chemicals is Serious Business."

"Installation Restoration Program. Phase II - Confirmation/Quantification Stage 1. Final Report for Former United States Air Force Plant No. 83, Albuquerque, New Mexico." September 1986. Prepared for United States Air Force Occupational and Environmental Health Laboratory (USAFOEHL), Headquarters Air Force Systems Command, and Headquarters Aeronautical Systems Division Facilities Management Division (ASD/PMDA).

Greenberg, J., 1982. "The Fight for Safety and Health at the Workplace." Consumer Health Perspectives, Volume VIII, No. 6, New York.

Greenberg, J., Editor, 1982. "Critical Issues in Workplace Health." Consumer Health Perspectives, Volume IX, No. 1, New York.

Langridge, W.H.R., Granados, R.R. and Greenberg, J.F., Journal of General Virology, 1981, Volume 54, pp. 443-448. "Detection of Baculovirus Protein in Cell Culture and Insect Larvae by Enzyme-linked Immunosorbent Assay (ELISA)."

Langridge, W.H.R. and Greenberg, J.F., Journal of General Virology, 1981, Volume 57, pp. 215-219. "Detection of Entomopoxvirus Proteins in Insect Cell Culture by Enzyme-linked Immunosorbent Assay (ELISA)."

Langridge, W.H.R., Granados, R.R. and Greenberg, J.F., Journal of Invertebrate Pathology, 1981, Volume 38, pp. 242-250. "Detection of Autographa californica and Heliothis zea Baculovirus Proteins by Enzyme-linked Immunosorbent Assay (ELISA)."

Vanessa J. DeVillez

Fields of Competence

Hydrogeologic analysis, including groundwater monitoring programs, aquifer testing, interpretation of analytical data, development and implementation of site investigations and sampling programs, site assessment, technical report preparation, and proposal development.

Experience Summary

Five years of varied hydrogeologic experience pertaining to hazardous waste, including the design and implementation of site investigations and assessments at NYS Superfund sites and remedial investigation/ feasibility studies. Other work includes RCRA and ECRA compliance.

Education

B.S. Geology, Indiana University, 1982
Two years of graduate work in Geology, SUNY, Buffalo

Key Projects

- Supervised RI/FS field activities for two USAF Facilities located in North Dakota and New York, including initial characterization of suspect areas of contamination.
- Supervised wells installation and pump test activities for Superfund site in New Jersey involving assessment of groundwater and soil contamination due to arsenic contamination.
- Conducted soil borings program at waste recycling facility in New Jersey to determine suitability for building construction.
- Supervised soil borings program at large waste disposal facility in Model City, New York to determine lateral and vertical extent of volatiles contamination.
- Provided technical support to PRP committee involved in Superfund sites in Michigan. This included observation of RI/FS activities conducted by Michigan regulatory agency.
- Assisted in a large-scale RI/FS of a politically sensitive industrial site in Michigan, which included the implementation of a variety of well installation techniques, groundwater sampling methods, and sampling instruments.

- Conducted an ECRA investigation of a manufacturing plant site in New Jersey to determine the extent of potential contaminant migration from an underground tank source. The tasks performed included test borings and soil sampling, installation of and sampling of groundwater monitoring wells, and interpretation and evaluation of analytical data.

- Conducted information searches, site inspections, and wrote Phase I reports for several Superfund Sites in New York State.

- Performed a Geotechnical investigation at an inactive plant site in Pennsylvania owned by a major electronics corporation. This included site inspection, subsurface investigation, and soil sampling.

- Assisted in the development of a groundwater monitoring plan for a large hazardous waste landfill in Niagara Falls, New York owned by a major waste disposal corporation. This included subsurface investigations, statistical analysis of priority pollutant analytical data to determine background levels of groundwater contamination, and establishment of upgradient and downgradient groundwater monitoring points.

- Provided investigative and technical support to a major waste disposal corporation for a politically sensitive hazardous waste landfill in New York State.

- Performed various geotechnical investigations at a plant site in Oklahoma owned by a major electronics corporation. These included subsurface investigation, monitoring well installation, permeability testing, and determination of the extent of plume migration.

Professional Affiliations

National Water Well Association

James A. Volz

Fields of Competence

Geology, hydrogeology, monitoring well installation, groundwater monitoring and sampling, other environmental sampling and report preparation.

Experience Summary

Experience as a project geologist/hydrogeologist in site hydrogeological investigations, hazardous waste site investigations, remedial alternative screening and remedial planning.

Education

B.S., Geology, West Virginia University, 1986
HART Health and Safety OSHA Certification Program

Key Projects

- Field team leader for an investigation aimed at evaluating the hydrogeologic conditions controlling the extent and rate of movement of an organic solvent contaminant plume in ground water at an automobile assembly plant in Delaware; also participated in the remedial evaluation process.

- Performed a preliminary review of the geologic and hydrogeologic conditions existing beneath a metal plating facility in Indiana which served as the basis for development of a site assessment/remedial investigation; subsequently was field team leader for the site assessment/remedial investigation and prepared the investigation report detailing the presence/extent of metals contamination in ground water.

- Participated in the synthesis and evaluation of the results of a hydrogeological containment investigation of a NPL site in Michigan.

- Participated in the development of a site assessment work plan and performed the field investigation for an uncontrolled hazardous waste site in New Jersey.

- Prepared a site assessment work plan for the closure of a foundry in Michigan.

(R1000A)

- Participated in the field investigation and prepared the U.S. Air Force IRP Phase 2 Stage 1 report for the investigation of areas of potential contamination on a military installation in North Dakota.

- Participated in computer application data synthesis for a five year plan detailing liability and compliance issues for a major automobile manufacturer.

- Prepared RI/FS Work Plans for a landfill site (NPL) in Michigan and for a copper and lead recycling facility (NPL) in Pennsylvania.

- Performed field investigations at two gasoline spill sites in Southern New Jersey aimed at determining the presence/extent of gasoline contamination of ground water.

- Field team leader for an environmental investigation for a major US pharmaceutical corporation in Sao Paulo, Brazil. The investigation was aimed at assessing the potential for ground water migration of solvents originating from leaking underground storage tanks.

- Member of a field team performing surface water and sediment sampling at a NPL site in Winchester, Virginia.

Professional Affiliations

Member Association of Ground Water Scientists and Engineers (NWWA).

(R1000A)

APPENDIX I.

TECHNICAL OPERATIONS PLAN AND SITE SAFETY PLAN

(CL5060B/0528N)

TECHNICAL OPERATIONS PLAN
INSTALLATION RESTORATION PROGRAM
PHASE II (STAGE I) - CONFIRMATION/QUANTIFICATION
MINOT AIR FORCE BASE
MINOT, NORTH DAKOTA

Prepared by:

Fred C. Hart Associates, Inc.
530 Fifth Avenue
New York, New York 10036

Prepared for:

Department of the Air Force
Occupational and Environmental Health Laboratory
Brooks Air Force Base, Texas 78235

December 1985
Revised September 1986

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1.0 INTRODUCTION

As requested by the U.S. Air Force Occupational and Environmental Laboratory (USAFOEHL), Fred C. Hart Associates has prepared the following Technical Operations Plan. This Technical Operations Plan is for the Phase II (Confirmation and Quantification) portion of the USAF Installation Restoration Program (IRP). The purpose of this Technical Operations Plan is to provide a detailed operations and sampling plan for field activities. The recommended work is based upon review of several documents; Phase I - Records Search (December 1984), Soil Investigation, Drainage Ditch "A," Soil Investigation Co. 1974, and assorted data provided by the U.S. Air Force (USAF) personnel at the Minot Air Force Base (MAFB), and included data gathered at a site visit conducted on October 29, 1985. This specific approach was taken with the intent to fulfill the requirements of the USAF Phase II investigation philosophy.

1.1 Purpose of Study

The purpose of this study is to assess potential contamination at past hazardous waste disposal or spill sites at the MAFB to determine: (1) the presence or absence of contamination within the specified areas of the field survey; (2) the potential for migration within the specified areas of the field survey; (3) the extent/magnitude of contamination on the MAFB property; and (4) potential environmental consequences and health risks of migrating contaminants (if found) based on state and federal standards for these contaminants. HART will prepare a final report evaluating the results of the field investigation which will include all historic and current data collected by HART on the facility, an analysis of all data collected during the investigation and an identification of any contaminants which may have originated from property other than the MAFB.

1.2 Site Description

The Minot Air Force Base (MAFB) is located approximately 14 miles north of the city of Minot in Ward County, North Dakota (Figure 1). The base accommodates two strategic combat wings, an air defense squadron and a number of smaller detachments on its 5,050 acres (Figure 2). A number

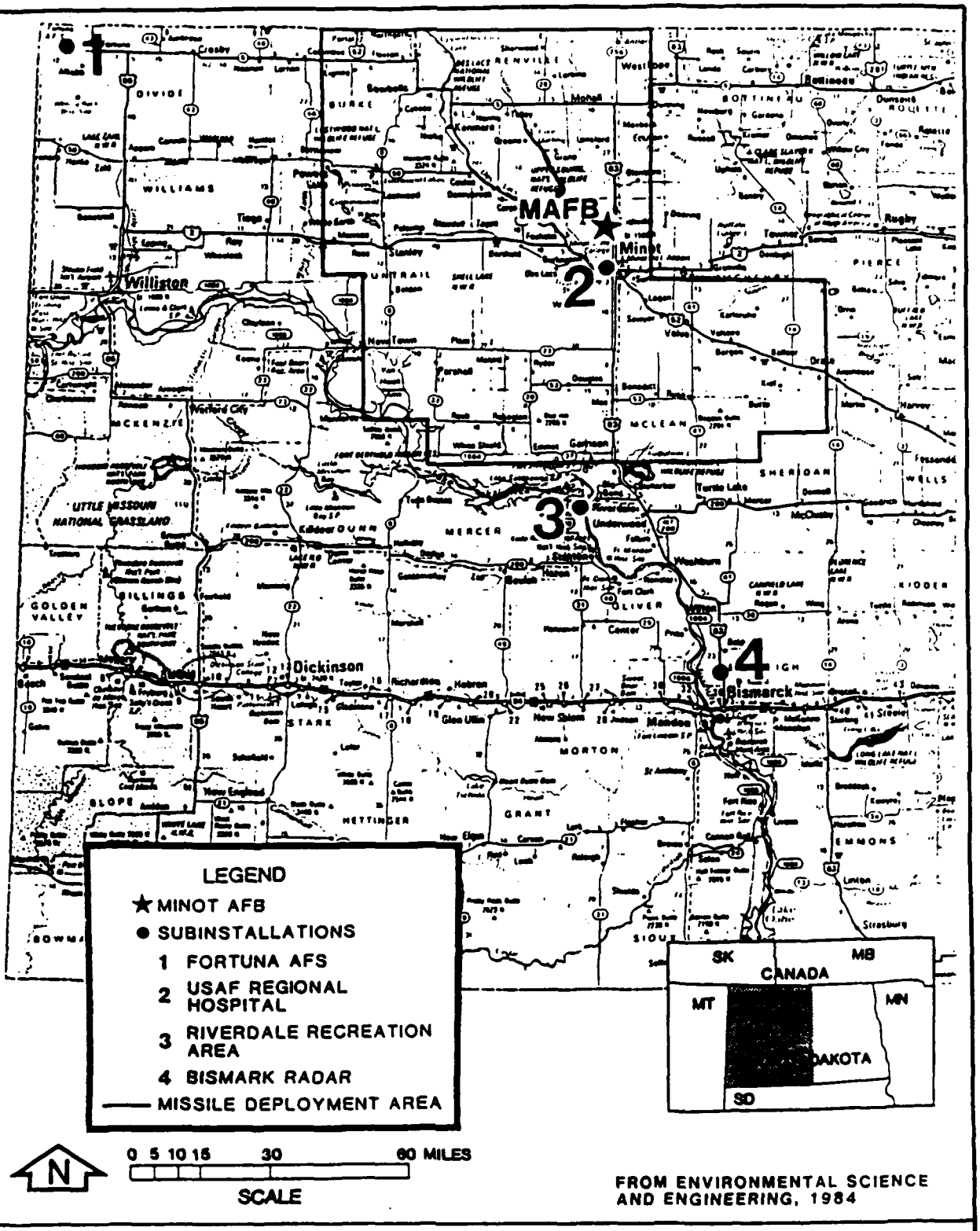


FIGURE 1

LOCATION MAP –
MAFB AND SUBINSTALLATIONS

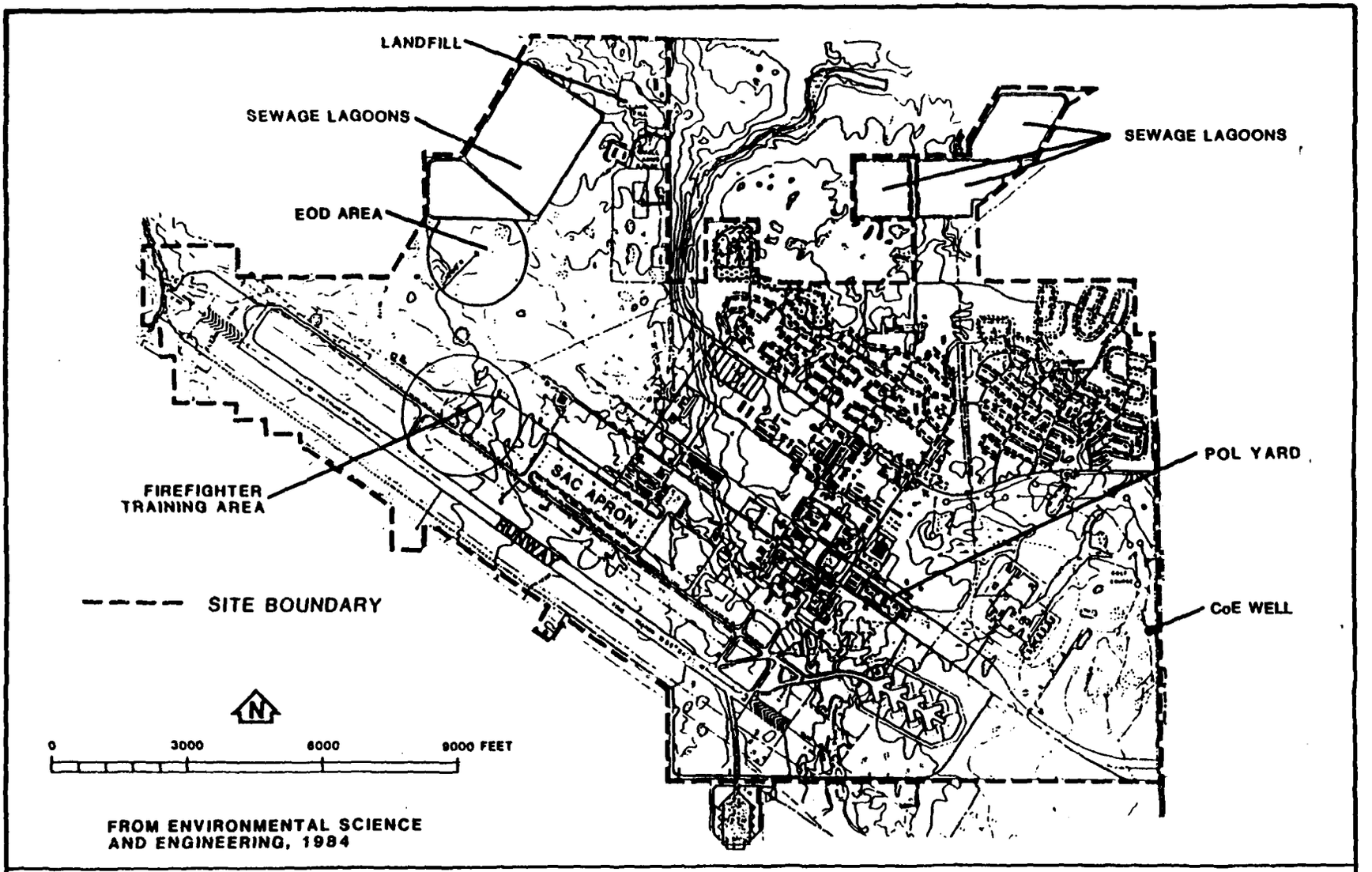


FIGURE 2

GENERAL BASE PLAN

of subinstallations are associated with the base. One hundred and fifty missile launch facilities and 15 launch control facilities are distributed within a 75 mile radius of MAFB. The Fortuna Air Force Station (AFS) Radar Site, Bismark Radar Bomb Scoring Site, USAF Regional Hospital in Minot and Riverdale Recreation Area are under the jurisdiction of MAFB.

The MAFB was constructed during the mid 1950s and is one of the newer bases in the USAF. The base is currently the home of the 57th Air Division, 91st Strategic Missile Wing (SMW), 5th Bombardment Wing (BMW), 91st Combat Support Group, USAF Regional Hospital and several tenant units.

The primary mission of the host unit, the 91st SMW, is to maintain the operational capability to permit the conduct of strategic missile warfare according to emergency war orders. The 5th BMW is the major tenant unit at MAFB and has the mission of maintaining the capability of effectively conducting intermediate and long range strategic bombardment operations and providing conventional bombing capabilities as part of the Strategic Project Force. The 91st Combat Support Group provides essential support to the two major wings assigned to MAFB.

1.3 Site History

The first portions of land for the base were purchased in 1955, and the first buildings were constructed about two years later. The Aerospace Defense Command's (ADCOM) 32nd Fighter Wing was activated in February 1957, and the following year the SAC 4136th Strategic Wing, with KC-135 "Strato-tankers," was assigned as a tenant unit. B-52 "Strato-fortress" bombers were added to the SAC wing's inventory in 1961. Two years later, the 4136th was redesignated the 450th BMW.

The first housing units opened in October 1960. Since then the MAFB housing area has become one of the largest in the Air Force with 2,470 family units.

The transfer of the base from ADCOM to SAC came in 1962 in conjunction with the arrival of the 810th Strategic Aerospace Division from Biggs Air

Force Base (AFB), Texas. With the division came the activation of the 455th Strategic Missile Wing (SMW) and a Combat Support Group. By 1964, all 150 Minuteman intercontinental ballistic missile launch facilities were completed and the last of the Minuteman I missiles were emplaced.

In June 1968, the 455th SMW was redesignated the 91st SMW, and one month later, the 450th BMW became the 5th BMW. John Moses Hospital, located in downtown Minot and which the Air Force had taken over from the Veterans Administration in 1959, became a USAF Regional Hospital in July 1969.

In July 1971, the 91st SMW's 741st Strategic Missile Squadron became the first Minuteman III missile squadron in the Air Force. Six months later, the 810th Strategic Aerospace Division was deactivated and the 91st SMW became the senior unit on base. At this point, the 91st SMW was then assigned to the 4th Strategic Missile Division, Francis E. Warren AFB, Wyoming and the 5th BMW became part of the 47th Air Division (AD), Fairchild AFB, Washington. In December 1971, the 91st SMW became the first fully-operational Minuteman III wing in the Air Force. The missile wing was realigned under the 47th AD in January 1973.

In January 1975, the 57th AD was activated at MAFB, replacing the 47th AD at both MAFB and Grand Forks AFB. This move localized command along with insuring that assigned units would be capable of conducting serial refueling, missile warfare and strategic reconnaissance according to the emergency war order. The 57th AD was later reorganized and augmented to fulfill Strategic Projection Force (SPF) responsibilities. On May 1, 1982, the 44th SMW and the 28th BMW at Ellsworth AFB, South Dakota were realigned to become members of the 57th AD. Also on May 1, Grand Forks AFB was assigned to the 4th AD at F.E. Warren AFB, Wyoming. The 55th Reconnaissance Wing, Offut AFB, Nebraska, 28th BMW, Ellsworth AFB and 5th BMW at MAFB combine to make up the SPF.

MAFB is presently the home of the 57th AD, 91st SMW, 5th BMW, 91st Combat Support Group, USAF Regional Hospital, 5th Fighter Interceptor Squadron, 2150th Communications Squadron and several other tenant units.

1.4 Hazardous Materials Handling

The major industrial operations at MAFB and its subinstallations relate to the maintenance of aircraft, missiles, ground vehicles and support facilities for the 91st SMW, 5th BMW and the 91st Combat Support Group. Operations include engine repairs/overhauls; electrical, hydraulic and fuel system repairs; painting; metal plating/finishing; missile system maintenance; aircraft maintenance; fuel supply and handling; and additional activities.

The main types of waste generated at MAFB are fuels, oils and solvents, paints and paint strippers, metal plating/treatment solutions and small amounts of explosives and pesticides. Waste fuel, oil and solvents including JP-4, engine oil, PD680 and acetone are derived primarily from periodic maintenance and engine repair. The general trend in waste disposal since the establishment of the base has been from largely unsegregated disposal in base landfills toward extensive waste segregation and contract disposal.

1.5 Potential Sources of Environmental Contamination

Three sites of potential environmental contamination have been identified at MAFB. These three have been identified in the Phase I - Records Search Report as Areas Nos. 1, 2 and 3. They are described briefly below and shown on Figure 3.

1.5.1 Area 1 - Sanitary Landfill

The base landfill, located adjacent to the sewage lagoons on the northwest corner of the base, was utilized from the initiation of base operations until 1982 for the disposal of domestic and other wastes, including petroleum, oils, lubricants and a variety of potentially hazardous wastes. Authorized disposal at the landfill is currently restricted to construction rubble, although there is evidence of unauthorized dumping of other materials, such as household furnishings, scrap woods, empty pesticide containers and empty drums.

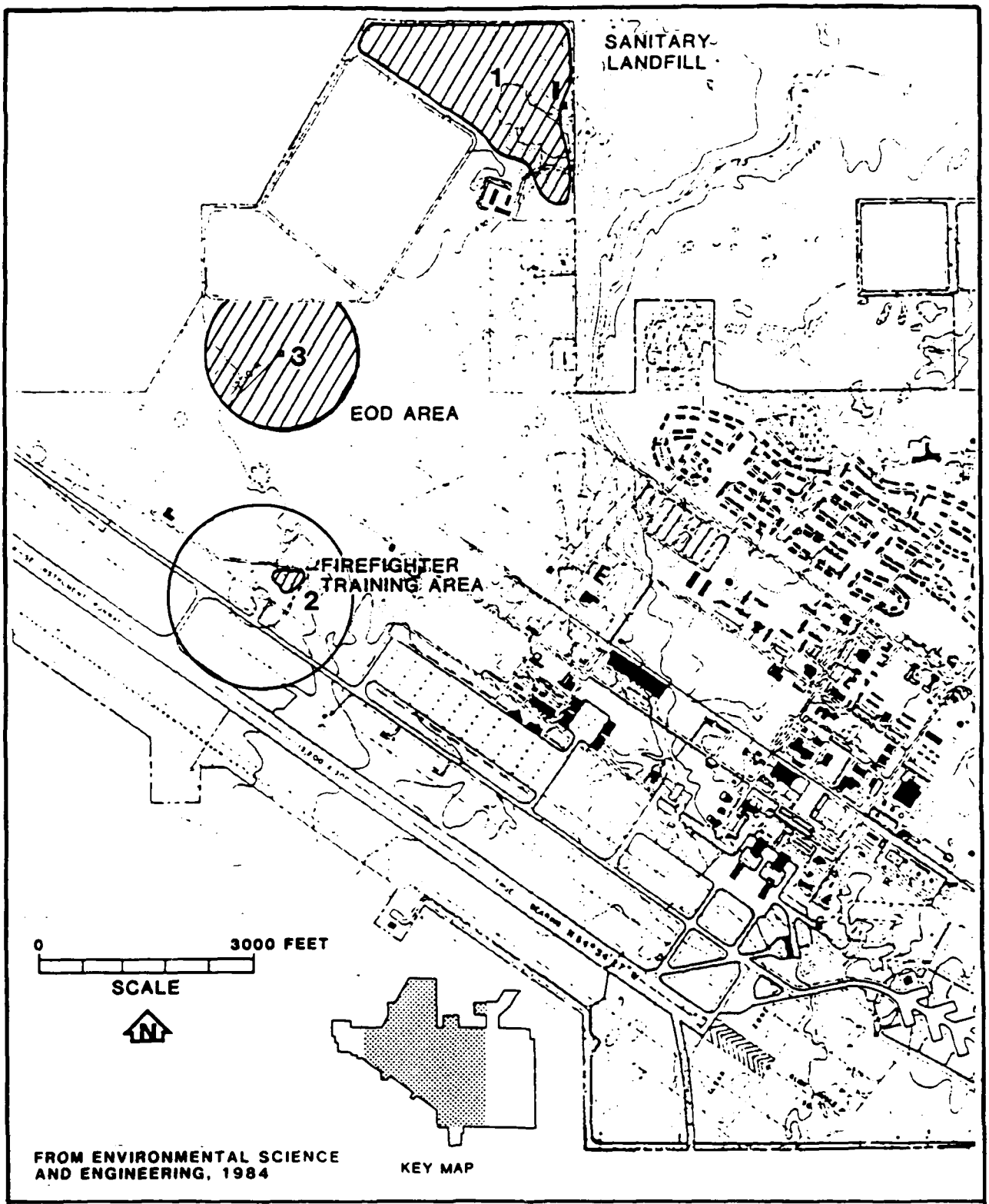


FIGURE 3

AREAS OF POTENTIAL
CONTAMINATION

An old trench in the landfill has begun to fill with rainwater, snow melt and leachate. Vigorous methane generation was observed in this trench (Phase I Records Search 1984). The leachate contains metals and phenols and may have originated from garbage and/or hazardous waste placed in the landfill (Phase I Records Search 1984). MAFB has installed four monitoring wells at this site.

1.5.2 Area 2 - Firefighter Training Area

The Fire Protection Branch (DEF) training area served as a contaminated fuel and lubricant disposal point for many years. The old burn pit was equipped with a drain line which allowed liquids poured into the pit to enter a nearby drainage ditch. Fuels entering the ditch soaked into the ditch bottom or were transported off-base by runoff. Located near the burn pit were oil lagoons used as contaminated fuel and lubricant disposal points. The area was used for oil disposal from early 1960 to around 1972, when the underground tanks at petroleum, oils and lubricants storage areas were installed. Approximately 2,000 gal of JP-4 are currently burned each month in training operations.

1.5.3 Area 3 Explosive Ordnance Disposal (EOD) Range

The EOD Range is used to burn, explode and bury unserviceable munitions, starter cartridges, flares, impulse cartridges, explosive bolts and explosives. Such operations are conducted approximately once each month. A potential for heavy metal contamination exists. A construction contractor used the area briefly as a staging area, so the potential for unreported fuel spills exists.

2.0 SITE INVESTIGATION SUMMARY

2.1 Introduction

The site investigation proposed by HART includes a study of individual sites at the plant suspected of being potential sources of contamination, plus a general surface water-sediment sampling program. Investigation of individual sites will include the following areas:

- Sanitary Landfill
- Firefighter Training Area
- Explosive Disposal Ordnance Area

2.2 Task 2 Site Investigation - Sanitary Landfill

2.2.1 Subtask 2.1 Groundwater Monitoring Well Installation

Nine shallow boreholes (20 feet) SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, SW-7, SW-8, SW-9 and three deep boreholes (100 feet) DW-1, DW-2, DW-3 will be drilled around the perimeter of the sanitary landfill and be completed as groundwater monitoring wells (Figure 4). The three deep boreholes will be grouted to the surface upon completion, and three additional 50 foot boreholes will be drilled adjacent to the 100 foot borings which will be completed as monitoring wells. During drilling, lithologic samples will be taken at five-foot intervals and borehole descriptions prepared. Since the 100 foot boreholes will be sampled every five feet, there will be no need to sample the 50 foot boreholes adjacent to them which will be completed as groundwater monitoring wells. Also, the three shallow boreholes (SW-2, SW-4, SW-7), which will be nested next to deep boreholes, will not be sampled. From previous studies at the site, the water level of the first water encountered is expected to be less than ten feet. Wells will be constructed of 2 inch Schedule 40 PVC flush joint casing with machine slotted 10 slot (.01 inch) screen that are 10 feet in length (Figure 5).

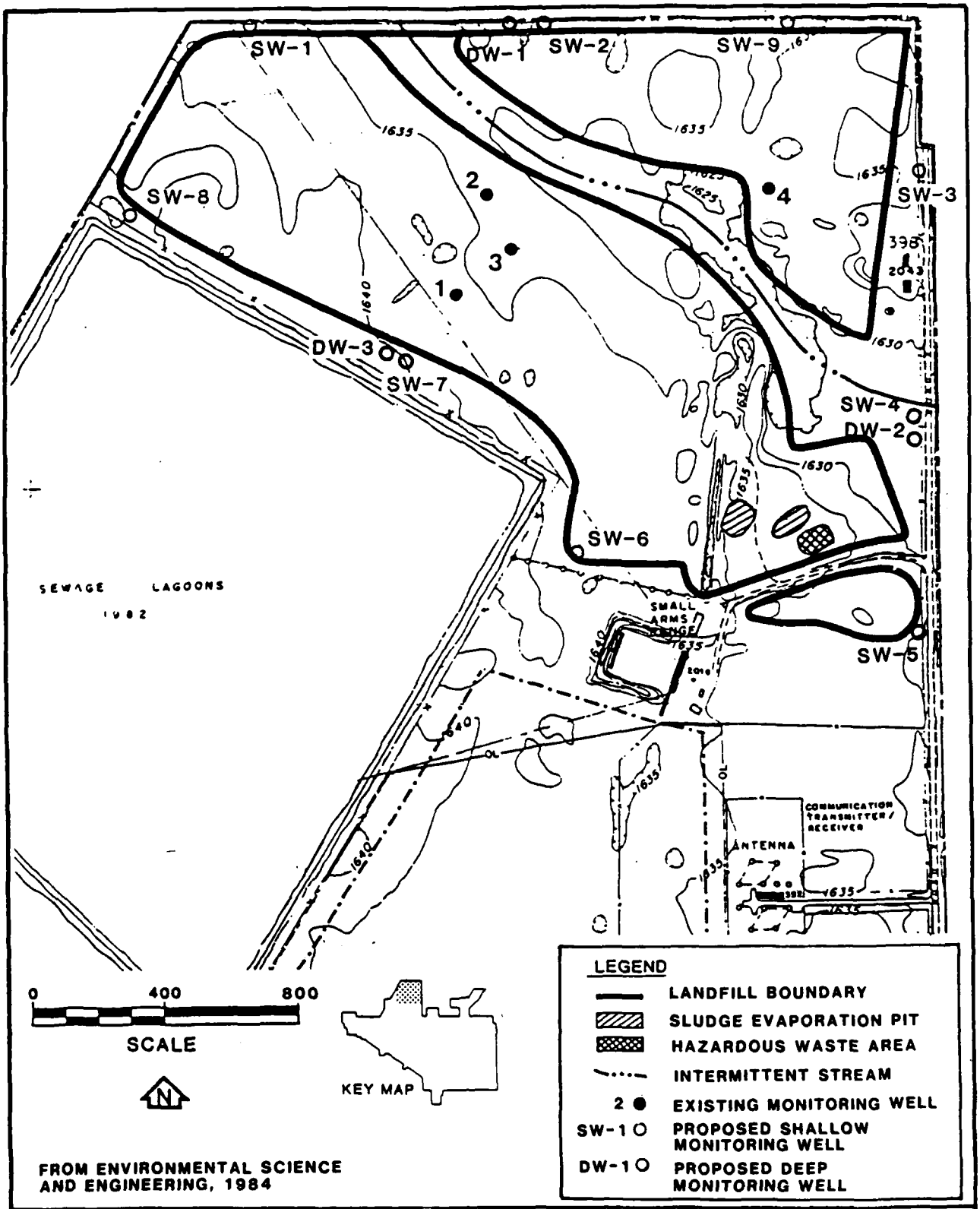


FIGURE 4

SANITARY LANDFILL: LOCATION OF GROUNDWATER MONITORING WELLS

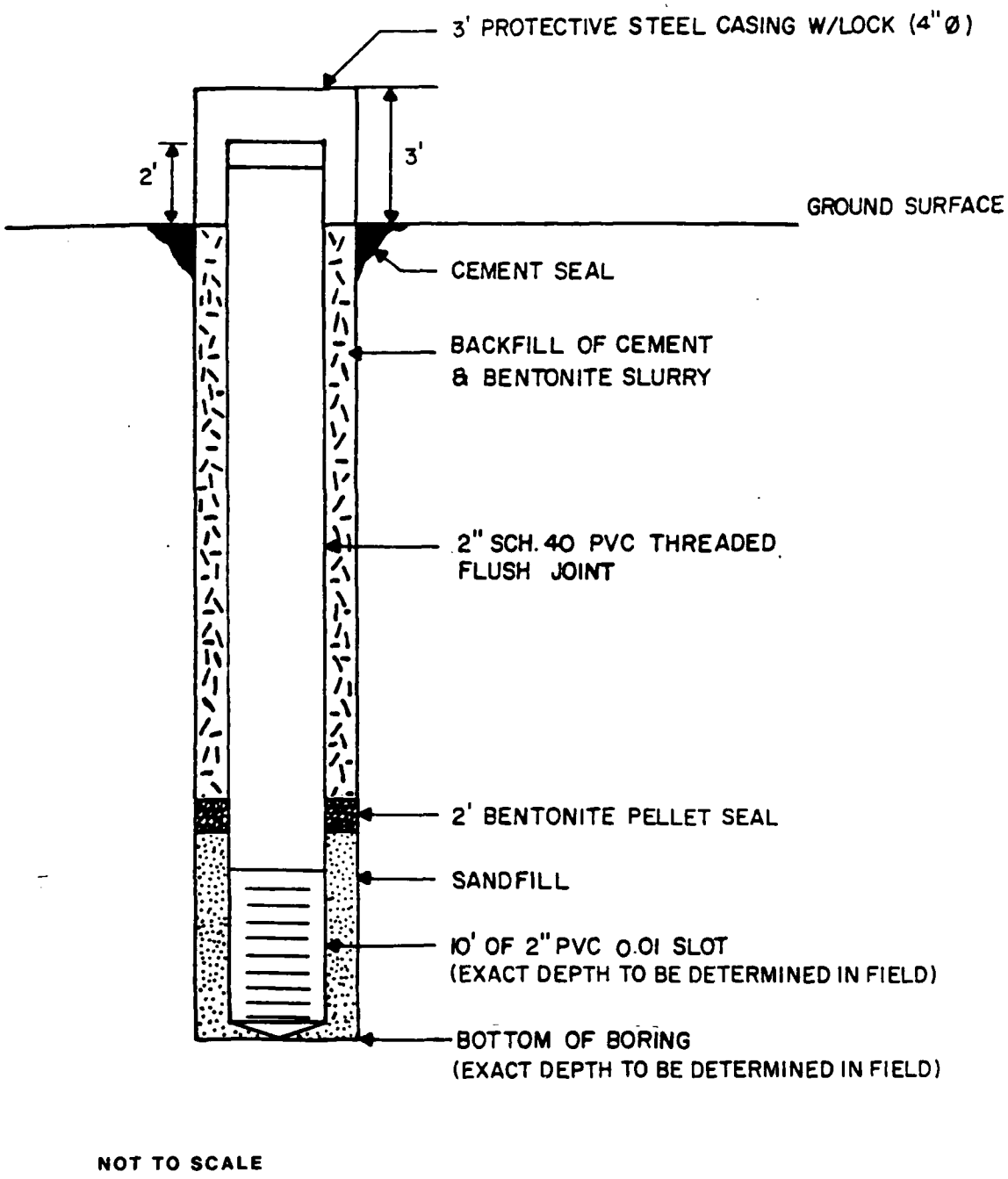


FIGURE 5

GENERALIZED
WELL CONSTRUCTION DIAGRAM

Each well will receive a filter pack, bentonite pellet seal, have the annular space grouted to the surface and a protective casing with locking cap will be installed. Each soil sample obtained will be described and will be screened with an Organic Vapor Analyzer (OVA) to determine the presence and degree of hydrocarbon contamination. Wells will be installed through a hollow stem auger if it is necessary to keep the borehole open. Otherwise at the discretion of the field team leader the augers will be removed and well construction will commence. The augers will be steam cleaned between each borehole and the split spoon sampler will be decontaminated between each sample.

Geotechnical analyses will be performed on soil samples to determine permeability and grain size distribution. Three shelby tube samples will be taken in the saturated zone for falling head permeability testing. The sample locations will be chosen in the field. Additionally, one soil sample from each of the three deep boreholes (DW-1, DW-2, DW-3,) and each of the three shallow boreholes (SW-1, SW-3, SW-5) will be selected and analyzed for grain size distribution. All drill cuttings which are suspected of being hazardous based on visual inspection or OVA readings will be shoveled into 55-gallon drums during the drilling and sampling of the boreholes. A maximum of ten new drums has been requested by the USAF for this purpose. The drums will be stored in a central location during the Phase II Investigation. They will be sampled for RCRA EP Toxicity metals concentration. They will be disposed of by the MAFB.

2.2.2 Subtask 2.2 Surface Water Sampling of Drainage

This subtask involves the sampling of surface water emanating from the sanitary landfill. A maximum of four surface water samples will be taken at locations chosen in the field. The samples will be analyzed for petroleum hydrocarbons, aromatic and halogenated volatile organics, 13 priority pollutant metals, extractable priority organic pollutants, total dissolved solids (TDS) and common anions. In addition, the pH, conductivity and temperature will be measured in the field. All water samples will be split with the Air Force. Procedures for splitting water samples can be found in the Technical Operations Plan in Chapter 13.

2.2.3 Subtask 2.3 Groundwater Sampling Requirements

The sampling of wells at this area will consist of the 12 HART installed wells and the 4 existing wells. All water samples will be analyzed in the field for pH, specific conductance and temperature. Splits will be made of all groundwater samples with the USAF, following procedures found in the Technical Operations Plan in Chapter 13 . The samples will be analyzed for petroleum hydrocarbons, aromatic and halogenated volatile organics, 13 priority pollutant metals, extractable priority organic pollutants, total dissolved solids (TDS) and common anions.

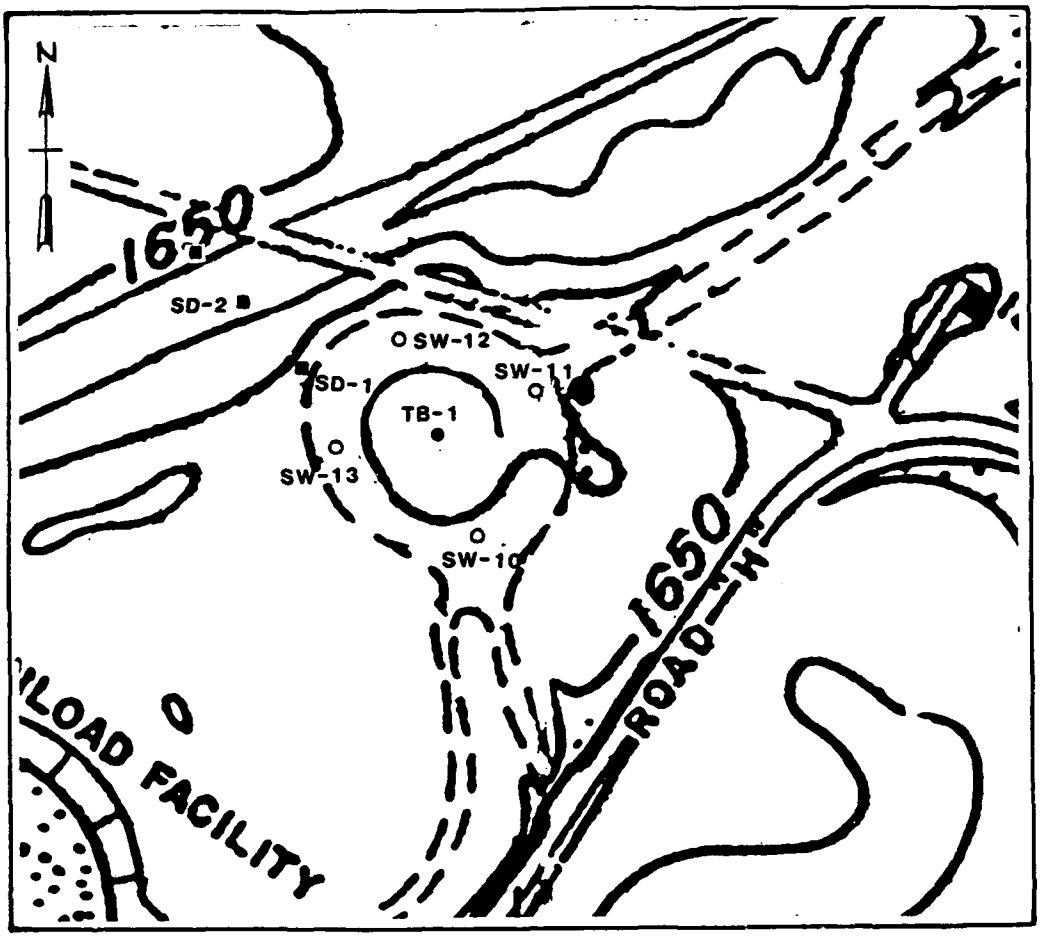
Geotechnical testing will be performed on samples to aid in determining groundwater flow rates by testing for permeability and grain size analysis.

2.3 Task 3 - Site Investigation: Firefighter Training Area

2.3.1 Subtask 3.1 Groundwater Monitoring Well Installation

Four shallow boreholes (30 feet) will be drilled around the perimeter of the Firefighter Training area (FTA) and will be completed as groundwater monitoring wells (SW-10, SW-11, SW-12, SW-13) (Figure 6). The boreholes will all be sampled for lithologic information at five-foot intervals with a split spoon sampler. Wells will be constructed of 2 inch Schedule 40 PVC flush joint casing with machine slotted 10 slot (.01 inch) screens that are 10 feet in length (Figure 5). The water level of the first water encountered is expected to be greater than 20 feet based on previous boreholes near the FTA.

Each well will receive a filter pack, bentonite pellet seal, have the annular space grouted to the surface and a protective casing with locking cap will be installed. Each soil sample obtained will be described and screened with an Organic Vapor Analyzer (OVA) to determine the presence and degree of hydrocarbon contamination. Wells will be installed through a hollow stem auger if it is necessary to keep the borehole open. Otherwise at the discretion of the field team leader the augers will be removed



LEGEND

■ SW-10 PROPOSED SHALLOW MONITORING WELL

● TB-1 BOREHOLE

○ SD-1 SEDIMENT SAMPLE

FIGURE 6

FIREFIGHTING TRAINING AREA-
LOCATIONS OF GROUNDWATER MONITORING
WELLS, BOREHOLE AND SEDIMENT SAMPLES

and well construction will commence. The augers will be cleaned with a steam cleaner between each borehole and the split spoon sampler will be decontaminated before each sample.

Geotechnical analyses will be performed on soil samples to determine permeability. In two of the four boreholes a shelby tube sample will be taken in order to perform falling head permeability testing. The boreholes and sample depths will be chosen in the field. In addition, one sample from each borehole will be tested for grain size distribution.

2.3.2 Subtask 3.2 Borehole Investigation

One borehole (TB-1) will be drilled to 30 feet in the center of the FTA. The boring will be sampled at five-foot intervals and each soil sample obtained will be screened with an OVA. Particular attention in describing samples will be directed towards discoloration and odor. Four samples will be retained for chemical analysis based on OVA readings, odor and/or discoloration. These samples will be analyzed for petroleum hydrocarbons, aromatic and halogenated volatile organics and lead. The borehole will be grouted to the surface with a cement bentonite slurry upon completion. This borehole will help determine the lower boundary for vertical soil contamination. Safety requirements for this borehole are discussed in Appendix A.

2.3.3 Subtask 3.3 Sediment Sampling

Sediment sampling will be performed at the following three locations in the drainage ditch leading away from the firefighter training area: the effluent side of the culvert in the ditch, just inside the base boundary where the ditch leaves the base, and at a point of suspected contamination selected in the field. These are approximately located on Figure 6, with the exception of the sample at the base boundary. The location of the sediment samples will be chosen in the field. Three sediment sampling locations will be sampled with a hand auger to a depth of one foot. Soil samples from the upper and lower six inch segments will be bottled and analyzed with the OVA (head space analysis). One sample for each location, with the highest concentration of hydrocarbons, will

then be sent to the laboratory for analysis for petroleum hydrocarbons, aromatic and halogenated volatile organics and lead.

2.3.4 Subtask 3.4 Groundwater Sampling Requirements

The four HART installed wells at the fire training area will be properly evacuated and sampled. All wells will be analyzed in the field for pH, specific conductance and temperature. Splits will be made of all groundwater samples with the USAF following procedures found in the Technical Operations Plan (Chapter 13). The samples will be analyzed for petroleum hydrocarbons, aromatic and halogenated volatile organics and lead.

2.4 Task 4 Site Investigation: Explosive Ordnance Disposal (EOD) Area

One test borehole (TB-2), 20 feet deep will be drilled at the EOD area at a site to be determined by the USAF base civil engineer (Figure 3). The boring will be sampled at five-foot intervals for lithologic information via split spoon samplers and each sample will be monitored with the OVA. Two samples from this borehole will be analyzed at the lab for petroleum hydrocarbons and the 13 Priority Pollutant metals. The samples selected for chemical analyses will be based on OVA readings, odor and/or discoloration. The borehole will be grouted to the surface with a cement bentonite slurry upon completion.

2.5 Task 5 Groundwater Sampling Program (Including Corps of Engineers Well)

A total of 21 wells will be sampled (Figure 7). This includes the 16 wells installed for this study and the four existing monitoring wells plus the Corps of Engineers well. Prior to sampling, all wells will be properly flushed to provide representative samples. Bailers will be decontaminated between wells. Samples will be placed in properly prepared bottles and placed in a cooler at 4°C until analysis. Coolers will be sealed and shipped overnight to Princeton Testing Laboratories. Samples

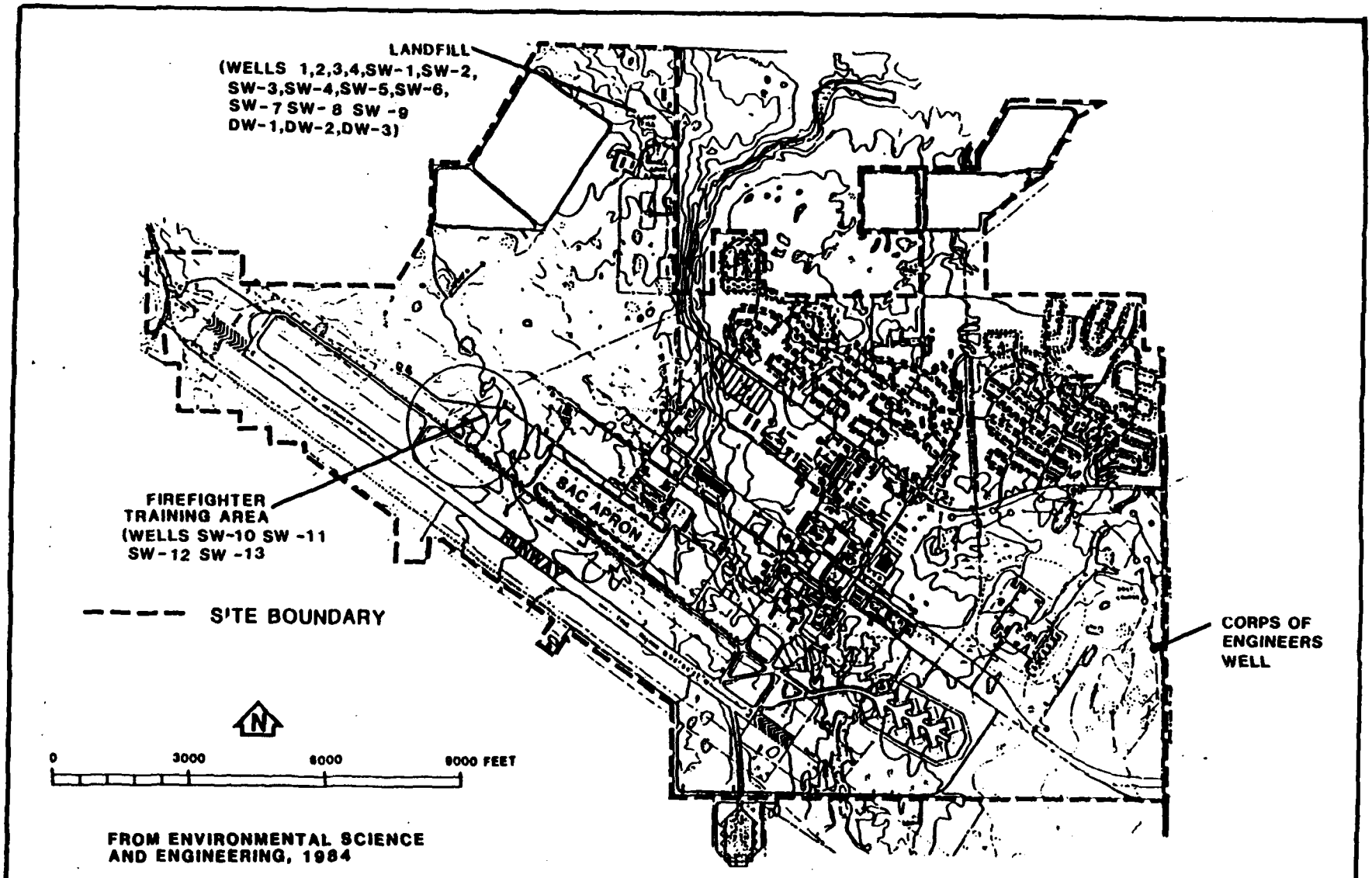


FIGURE 7

GROUNDWATER SAMPLING LOCATIONS

(For Exact Locations See Individual Area Maps)

will be split and a set of samples will be sent to OEHL in Texas. Proper chain-of-custody procedures will be followed which are defined in Section 14.0.

The specific analytical parameters for each of the remedial investigations are found in Table 1. They have been described in each subtask under "Groundwater Sampling Program". The Corps of Engineers well, not described in any other subtask or tasks will be analyzed in the field for pH, specific conductance and temperature, and in the laboratory for aromatic and halogenated volatile organics, petroleum hydrocarbons, total dissolved solids, 13 priority pollutant metals and common anions.

Wells will be sampled all at once rather than individually because it is more convenient to perform one round of sampling rather than sample individual wells as they are completed. Also, samples cannot be stored for any length of time, requiring samples to be shipped within a few days of their collection.

2.6 Task 6 - Surveying of Wells and Sample Locations

A professional surveyor will survey the horizontal and vertical locations of the wells and surface water/soil/sediment sample locations.

2.7 Task 7 - Water Level Measurements

Measurements will be made of all the water levels in all groundwater monitoring wells at the MAFB. This will be completed in one day.

TABLE 1

SUMMARY OF PROPOSED SAMPLES

Task/Subtask No.	Soil Chemical Analysis	Sediment Analysis	Surface Water and Groundwater Analysis*	Geotechnical Analysis
2.1				(3) Falling Head Permeability (6) Grain Size Analysis (sieve and hydrometer)
2.2			(4) Aromatic and halogenated volatile organics, petroleum hydrocarbons, priority pollutant metals, extractable priority organic pollutants, total dissolved solids, common anions	
2.3			(16) Same as Subtask 2.2	
3.1				(2) Falling Head Permeability Tests (4) Grain Size Analyses (sieve and hydrometer)
3.2	(4) Petroleum hydrocarbons, aromatic and halogenated volatile organics, lead			
3.3		(3) Petroleum Hydrocarbons aromatic and halogenated volatile organics, lead.		
3.4			(4) Aromatic and Halogenated volatile organics, petroleum hydrocarbons, lead.	
4	(2) Petroleum Hydrocarbons, priority pollutant metals.			

* All water samples will be analyzed in the field for pH, specific conductance and temperature.

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TABLE 1 (CONTINUED)

SUMMARY OF PROPOSED SAMPLES

Task/Subtask No.	Soil Chemical Analysis	Sediment Analysis	Surface Water and Groundwater Analysis*	Geotechnical Analysis
5			(1) Aromatic and halogenated volatile organics, petroleum hydrocarbons, priority pollutant metals, total dissolved solids, common anions.	

* All water samples will be analyzed in the field for PH, specific conductance and temperature.

3.0 FIELD SET-UP

3.1 Detailed Work Plan

Prior to undertaking sampling or drilling operations, HART will prepare for an effective and safe field investigation at the MAFB. This will include establishing a command office and materials storage area. Portable decontamination equipment necessary to perform operations will be provided as described in Section 11.0, Decontamination Procedures. HART and its subcontractors will also have sufficient safety equipment of adequate quality and level to equip the number of personnel necessary to perform the sampling described in this plan, according to the Site Safety Plan prepared for this investigation (Appendix A).

HART is responsible for having in the field the subcontracted drilling, sampling and well testing equipment necessary to perform the required work. This will include providing drums and other facilities necessary for temporary field storage of potentially contaminated soil and disposable equipment.

This Field Operations Plan contains the details of the work planned at the MAFB and will be available to on-site personnel.

3.2 Health and Safety Plan

To protect the health and safety of field personnel a Health and Safety Plan identifying the expected hazardous material and levels of safety is found in Appendix A.

3.3 Subcontractors

Several subcontractors have been identified to perform work on this site and are listed below:

- Geochemical Analysis

  Princeton Testing Laboratories
  Princeton, New Jersey

- Drill and Install Monitor Wells

  Twin City Testing Corporation
  Bismark, North Dakota

- Surveyor

  Nesdahl Surveying & Engineering, P.C.
  Minot, North Dakota

- Geotechnical Analysis

  J & L Laboratory
  Pittsburgh, Pennsylvania

4.0 CALIBRATION OF FIELD EQUIPMENT

The following measuring equipment will be necessary to use for the on-site remedial investigation.

OVA. For in-field analysis of soil-gas during drilling, screening of soil samples taken during drilling and sediment samples. Calibration required: The OVA will be calibrated so that the relative response of the instrument will be 100% for tetrachloroethylene or methane.

pH Meter. For in-field analysis of water samples. Calibration required: Factory or laboratory buffer and litmus paper will be used.

Electric Conductivity Meter. For measurement during well sampling. Calibration: Factory calibrated annually.

Mercury Thermometers. For measurement of water temperatures during sampling. Calibration: Factory calibrated once.

M-Scope. For measurement of water level in well. Calibration: Periodically measured against surveyor's tape.

Other equipment that might become necessary during the field investigation will be calibrated according to the manufacturers' recommendations and/or generally accepted practice. Calibration procedures will be documented for the project file.

5.0 PREVENTIVE MAINTENANCE OF FIELD EQUIPMENT

All equipment used by HART and its subcontractors for work for the off-site remedial investigation will be required to be maintained under a preventive maintenance program. HART uses a program of preventive maintenance for the following equipment expected to be used.

- OVA
- pH Meter
- Electrical Conductivity Meter
- Mercury Thermometers
- M-scope

HART will subcontract the following activities during the study.

- Drilling and installation of monitoring wells
- Surveying of measuring points for wells

HART has specified or will specify to subcontractor firms providing these services that any and all equipment used at the MAFB be maintained in a proper and safe working order. Any equipment or device determined to not be in such order by HART field personnel will be replaced, repaired, or corrected.

6.0 FIELD ANALYTICAL PROCEDURES AND DATA REPORTING

6.1 Chemical Data

Procedures for Field Measurement of pH. Readings will be taken periodically in buffer solutions of the appropriate range at the same temperature during repeated sampling events. The users manual for the pH meter will be available to field personnel.

- Procedures for Field Measurement of Electrical Conductivity. When rapid sample changes are not occurring or expected, replicate measurements will be made. A standard solution of known conductivity may be made available for checking precision. Several readings are taken and the arithmetic mean used as the reported value. The users manual for the electrical conductivity meter will be available to field personnel.

- Procedures for Field Measurement of Volatile Organics. Approximately 20 ml of soil will be placed in VOA vials. The vials will be placed in a 50°C hot water bath for 10 minutes. An aliquot of air from the head space within the vial will then be withdrawn by syringe for direct injection into the OVA.

6.2 Hydraulic Data

- Procedures for Measurements. An M-scope will be used to measure to 0.01 foot the water level under static (non-pumping/static) conditions.

6.3 Soil Boring Data

- Soil Sampling. Split spoon samples will be collected at each test boring site. Sample depth will be monitored by the subcontractor (driller) under the supervision of the on-site geologist.

- Blow Counts. Soil density shall be determined by recording the number of blows necessary for the split spoon to penetrate six inches of soil.

6.4 Surveying Data

- Horizontal Location. All sampling sites and monitoring wells will be located on aerial photographs or other map by reference to known features. Location accuracy will be one foot in general.

- Vertical Location. The elevation of all new monitoring wells and existing wells will be surveyed by a subcontracted licensed surveyor to the nearest 0.01 foot.

7.0 SAMPLE NUMBERING SYSTEM

A sample numbering system will be used to identify each sample taken during the on-site remedial investigation. The numbering system will provide a tracking procedure to allow retrieval of information about a particular site and assure that each sample is uniquely numbered. A listing of sample numbers will be maintained by the HART field team leader. Each sample number will consist of five parts as described below.

7.1 Project Identification

The designation MAFB will be used to identify Minot Air Force Base.

7.2 Site Identification

Each sampling site will be identified by a three to four letter identifier code, with the following prefix:

DW	Deep monitoring well
SW	Shallow monitoring well

A numerical suffix unique to each prefix will follow. A map and surveyors data will be used to locate each sampling site.

7.3 Sequence Number

A two letter code will be used to identify the type of sample collected, such as:

SS	soil sample collected during drilling
SD	sediment sample
GW	groundwater sample
SW	surface water sample

7.4 Sample Depth

The depth or depth interval at which the sample is collected will be noted on the label.

7.5 Investigation Sequence Sample Number

In addition to the numbers and symbols used to identify the location, type and depth of a sample, a numbering system will be used to indicate the order in which samples are sent to the various laboratories. This system will begin with the first chemical sample selected and end with the last. It will consist of a three digit number and will sequentially record the chemical samples selected during the investigation. The purpose is to track the chemical samples in order to identify any gaps. A duplicate system will be maintained for the split samples.

7.6 Split Sampling

Two sets of samples will be collected. Two types of labels to differentiate the analyzer of each set will be used: HART, for Fred C. Hart Associates, and USAFOEHL to indicate the sample that will be sent to the USAFOEHL laboratory.

7.7 Examples

Examples of sample numbers are:

- MAFB, DW-1, SS-3, 4'-6', HART 005. Minot Air Force Base; 50 foot deep Monitoring Well #1; third soil sample collected between a depth of four and six feet below the surface; retained by HART. Fifth chemical sample selected for analysis.

- MAFB, DW-1, SS-3, 4'-6', EPA 005. Same as previous sample, except it is retained for analysis by EPA-designated laboratory. Also identified as fifth chemical sample split and sent to OEHL and EPA.

7.8 Blanks, Knowns, Spikes, Splits and Duplicates

QA/QC blank and duplicate samples, to be sent to the USAFOEHL laboratory and the HART subcontractor, Princeton Testing Laboratories, will be given sample numbers similar to those for collected samples except that the sequence number will be unique. The identity of QA/QC samples will be recorded in field log books, but will not be marked in any way on the sample containers. A duplicate sample will be retained for every ten field samples. For every 20 field water samples collected, one field blank will be submitted for analysis. There will be one trip blank for every shipment of water samples to be tested for VOAs.

7.9 USAFOEHL Samples

Samples sent to the USAFOEHL laboratory will be accompanied by the following information:

1. Purpose of sample (analyte).
2. Installation name (base).
3. Sample number (on container).
4. Source/location of sample.
5. Contract task number and title of project.
6. Method of collection (bailer, suction pump, airlift pump, etc.).
7. Volumes removed before sample taken.
8. Special conditions (use of surrogates, filtering, etc.).
9. Preservatives used, especially nonstandard types.

8.0 DRILLING AND INSTALLATION OF GROUNDWATER MONITORING WELLS

Sixteen new monitoring wells are planned for installation. The proposed locations are shown in Figure 7. Each well site and maximum depth of drilling and casing are described below:

- DW-1, DW-2, DW-3 - Depth = 50 feet; screened interval = 40 to 50 feet, 2-inch diameter casing in 6-inch diameter hole.

- SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, SW-7, SW-8, SW-9 - Depth = 20 feet; screened interval = 10 to 20 feet; 2-inch diameter casing in 6-inch diameter hole.

- SW-10, SW-11, SW-12, SW-13 - Depth = 30 feet; screened interval = 20 to 30 feet; 2-inch diameter casing in 6-inch hole.

Subcontractor specifications for drilling and installing the groundwater monitoring well have been prepared by HART and will be used for the project.

8.1 Drilling

The project schedule requires the use of one drill rig for the duration of the project. All boreholes will be drilled using 6-inch I.D. hollow stem auger. Prior to drilling the wells, each site will be staked and underground utilities will be checked by MAFB personnel.

All drilling equipment and materials will be decontaminated prior to and after use according to procedures found in Section 11, Decontamination Procedures. Hollow auger drilling will be performed with hollow-stem augers having an internal diameter large enough to accommodate a 2-inch diameter sampler. The lead auger will be equipped with an appropriate cutting bit to allow penetration of a wide range of materials varying from clay and silt to sand and gravel.

Solid waste from the drilling will be analyzed with the OVA as it is generated. If hazardous chemicals of concern are not detected, the materials will be disposed of on-site. If drill materials are determined to be hazardous they will be drummed for later disposal by MAFB. Drummed materials will be tested for EP Toxicity (metals). Proper disposal of the material will depend on test results. MAFB will be responsible for disposal of materials that are determined to be hazardous.

8.2 Soil Sampling

Soil samples will be collected during drilling with split-spoon drive samplers of two-inch outside diameter. Decontamination procedures for sampling equipment are described in Section 11.0. Samples will be taken at five-foot intervals using a two foot long split spoon sampler. All soil samples will be logged in general accordance with "Description of Soils (Visual Manual Procedure)", ASTM D2488-69, which is based on the Unified Soil Classification System.

A portion of the soil sample from the least disturbed center of the split spoon will be placed in a VOA vial for on-site OVA analysis. The remaining portion of the soil sample will be placed in a properly labeled glass jar. The VOA vials will be analyzed in the field for the presence of volatile organic compounds and the results recorded. Based on the results, soil samples will be selected for submittal to the laboratories for further analysis.

Undisturbed samples for triaxial permeability tests using a Shelby tube sampler will be taken in both the Sanitary Landfill and the FTA. Both ends of the retrieved shelby tube shall be sealed with wax and no other form of sampling will be attempted from the tube to insure the integrity of the undisturbed sample. Samples will also be taken for grain size analysis.

Unless otherwise indicated by the OVA screening tests, it is anticipated that all soil samples will contain only low or medium concentrations of organics and low concentrations of inorganics.

8.3 Monitoring Well Construction and Completion

The on-site OVA testing of soil samples will aid in determining the depth to which the monitor well screen will be installed at each boring. The well screen will be installed adjacent to the zone of highest chemical concentrations within the aquifer of intended study. A generalized well construction diagram is shown in Figure 5.

The open borehole below the interval to be screened will be backfilled with appropriate material such as clean sand or gravel pack.

All wells will be 2 inches in diameter and have 10 foot length screens. All screens will have a slot (aperture) size of 0.010 inch. Riser pipe will be the same diameter as the screen and connected only by threaded type joints.

The gravel pack will consist of acid-resistant, washed and graded silica sand. The sand will be furnished in sacks and will be clean and free from oil, acid, organic matter or other deleterious substances. The gravel pack material will continue to be added to the annulus until the entire screen is surrounded and the gravel has extended about 3 feet above the top of the screen. A 5-foot thick bentonite pellet layer will then be placed in the annulus and set directly on the gravel pack. The bentonite pellet seal will assure that no grout materials will percolate through the gravel pack and enter the well.

All but the top 2 feet of remaining annulus will then be tremmie grouted with a granular bentonite/cement slurry mixture. The top 2 feet will be grouted with cement, and a 5 foot long steel casing will be set into this cement. If possible, this outer steel casing will extend about 3 feet above ground surface. The outer protective steel casing will come to rest within several inches of the top of the riser pipe, and will have a locking cap.

Following the completion of each monitor well, HART field personnel will construct a detailed well-completion sketch. This well summary will

also detail the composition and amount of the materials used during well construction.

The vertical elevations of the monitor wells (referenced to Mean Sea Level) will be surveyed by a subcontracted licensed surveyor to an accuracy of 0.01 foot. The survey point will be marked on the uncapped well casing.

8.4 Well Development

All groundwater monitoring wells will be developed as part of the well installation process. Development will be done to create a good hydraulic connection between the well and the aquifer in which it is screened. This is important for obtaining reliable groundwater data and representative groundwater samples. Well development is achieved by removing fine-grained geologic materials away from the well screen. Each well will be developed as soon as practical after completion by jetting. If possible, well development will continue until discharge water is clear and free of sediments.

9.0 GROUNDWATER MONITORING AND SAMPLING

A total of 21 wells will be sampled. This includes the 16 wells installed for this study and the four existing Sanitary Landfill (1, 2, 3, 4) monitor wells and the Corps of Engineers well. All measuring, purging and sampling equipment will be decontaminated as described in Section 12.0 prior to data collection.

9.1 Groundwater Level Measurements

After all well installation is completed, the groundwater level of all the wells will be measured within a 24-hour period. The instrument (M-scope: Slope Indicator Co., Model 51453) will be lowered down the well and measured from the top of the PVC casing. When the electrode of the M-scope comes into contact with water, an audio signal will be emitted. The instrument will also be used to sound the bottom of the well.

9.2 Surveying of Wells

A professional surveyor will survey the horizontal and vertical locations of the wells. Survey elevations of all newly installed monitor wells with respect to a USGS Bench Mark and will be measured to an accuracy of 0.01 feet and horizontal locations will be done to an accuracy of 1 foot and recorded on site maps. It is necessary to establish the elevation of well casings for calculation of groundwater elevations.

9.3 On-Site Analysis

Monitor Well Sampling. In order for valid representative groundwater samples to be collected from the monitor wells, it is very important to properly prepare the well prior to sample collection. This preparation entails removing all the water which is standing in the casing and grabbing the sample from water which has recently been recharged from the aquifer.

To accomplish this, the depth to water from the top of the well casing is measured. This value will be used in conjunction with the total casing length to determine the height of the water column. The volume of water standing in the well will then be calculated. Three to five times this volume will be removed by pumping or bailing before the sample is collected. In case where a well is bailed until dry and is very slow to recover, the volume required for evacuation may be reduced to one well volume.

Once the well is adequately evacuated, sample collection will be accomplished by lowering a stainless steel or teflon, bottom loading bailer with a teflon check valve into the well. Each bailer will be fitted with a stainless steel wire leader and a new piece of nylon cord. A different pre-cleaned bailer will be devoted to each well. If the bailer has not been used for well evacuation, the first 3 bails of water will be wasted to rinse any cleaning agents which might still be present on the bailer. The samples will be poured directly from the bailers to sample jars for temperature, pH and specific conductance.

Temperature. Measurements of the sample temperature will be taken using a mercury thermometer. The field measurement represents the temperature of the aquifer unit at a particular location and time. Variations in sample temperature may enable interpretation of a temperature gradient which reflects aquifer hydraulics. This measurement will also be used to calibrate the pH and conductivity meters in the field.

pH. The pH of each sample will be measured with a Corning Model 3 pH Meter or similar instrument. Field measurements of sample pH will be used as a relative check of the lab measurements. The pH of a sample tends to change upon contact with air, and stabilizes once the sample becomes fully aerated. Therefore, the pH measurements of aerated samples will be used as a relative indicator of groundwater contamination.

Specific Conductivity. The specific conductivity of each sample will be measured with a Hach Model 17250 Conductivity Meter (or similar instrument). Elevated specific conductivities indicate the presence of conductive ions such as chlorides and sulfides in the groundwater.

9.4 Sampling for Off-Site Analysis

Prior to sampling for lab analysis all wells will be properly flushed as described above in Section 9.3. Bailers will be used to obtain groundwater samples. Bailers will be decontaminated between wells. Samples will be placed in properly prepared bottles, and placed in a cooler at 4°C. Coolers will be sealed and shipped overnight to the designated laboratory. Samples will be split and one sample will be shipped to the EPA-designated laboratory and the other sent to Princeton Testing Labs. Proper chain-of-custody procedures will be followed when transferring the samples from the field to the laboratory. In addition, accurate records will be kept of all sampling activity and will include the following information: date, time, location, sample number, depth to water measurement, method and volume of water evacuation and sampling techniques. Sampling parameters have been discussed in Section 2.0.

10.0 SURFACE WATER SAMPLING

Surface water will be sampled at the drainage ditch leading from the landfill. More details are provided in Section 2.2.2. Samples will be split, with one set being shipped to OEHL and the other to Princeton Testing Labs. Proper chain-of-custody procedures will be followed when transferring the samples from the field to the laboratory. In addition, accurate records will be kept of all sampling activities, and will include the following information: date, time, location, sample number, depth and sampling techniques. Analytical parameters are discussed in Section 2.2.2.

11.0 SOIL/SURFACE WATER-SEDIMENT SAMPLING

Soil and surface water sediment samples will be collected in various tasks of this investigation. More details are provided in Sections 2.3.3 and 2.6. Samples will be split, with one set being shipped to OEHL and the other to Princeton Testing Labs. Proper chain-of-custody procedures will be followed when transferring the samples from the field to the laboratory. In addition, accurate records will be kept of all sampling activities and will include the following information: date, time, location, sample number, depth and sampling techniques. Analytical parameters are discussed in Sections 2.2.3 and 2.6.

12.0 DECONTAMINATION PROCEDURES

All equipment which comes in contact with potentially contaminated soil or water, including OVA, drilling, soil and water sampling, water-level measuring and sample preparation equipment, will be cleaned prior to and after each use on this project. Decontamination will consist of combinations of steam cleaning and/or detergent (trisodium phosphate) wash, water rinse, methanol rinse and distilled water rinse. An organic-free water rinse will be used instead of distilled water for those samples analyzed for volatile organics.

12.1 Drilling, Soil Sampling and Monitoring Well Installation

All drilling equipment will be decontaminated by steam-cleaning between locations, to prevent the chance of cross contamination from one location to another. All tools used for soil sampling and packaging, including split-barrel samplers, sample-cutting knives, etc., will be decontaminated prior to the collection of each sample. Decontamination of these tools will include a wash in distilled water, a solvent rinse and a second rinse with distilled water. Monitoring well casing, screens and fittings are to be delivered to the site in a clean condition.

During the field sampling program, the OVA will be checked periodically for contamination by running an analysis of a known compound of air. When necessary, the equipment will be decontaminated prior to continuing work, but not less frequently than once per day. OVA equipment to be decontaminated as necessary will include syringes, injection ports, columns and detectors.

12.2 Well Development

All equipment used for well development will be decontaminated prior to and after use at each well. This will include decontamination of downhole piping. The decontamination procedures will be similar to those described for drilling equipment in Section 12.1.

12.3 Water Level Measurement

The electrical sounding (M-Scope) tape used to measure water levels will be cleaned with a distilled water spray, unless contamination is noted. If contamination is indicated, a liquinox wash will be used, followed by a distilled water rinse.

12.4 Water Sampling

Stainless steel or teflon bailers will be decontaminated before and after each use by detergent wash, clean water rinse, methanol rinse and distilled water rinse. No bailer shall be used at more than a single well after and prior to decontamination. A new piece of nylon rope will be used as the hoisting line and disposed of when sampling is completed at each well.

Any submersible pump, piping and fittings used will be decontaminated prior to and after use at each well. The equipment will be decontaminated by either steam-cleaning or hot water and detergent wash with methanol rinse followed by distilled water rinse.

12.5 Sediment Sampling

Decontamination procedures will follow those described in Section 12.1 for soil sampling equipment.

12.6 Personnel Decontamination

The personnel decontamination procedures to be used at MAFB will be performed at each drilling location or other sampling sites prior to entering vehicles or leaving the study area. HART and each subcontractor will provide all protective clothing for its own personnel and the equipment necessary to comply with decontamination procedures specified in the Site Safety Plan (Appendix A).

In the interest of expediency and efficiency, the following personnel decontamination procedures will be followed, if necessary. It is anticipated that field investigation activities will be conducted at Level D, and the following procedures will be followed:

1. Remove disposable booties (if used) and place into plastic bag for disposal.

2. Wash outer gloves in detergent solution and rinse in clean water. Remove outer gloves and place into plastic bag for disposal or retain for subsequent reuse.

3. Wash neoprene boots with detergent solution and rinse with clean water. Remove boots and retain for subsequent reuse.

4. Remove the tyvek coveralls. Take care to prevent the release and dispersion of dusts which may have accumulated on the coveralls during on-site operations and place overalls into the disposal plastic bag.

5. Place all independent disposable bags into one larger bag. Seal this bag and dispose of as garbage unless OVA probe of samples indicates contact with high concentrations of hazardous materials. If high concentrations are indicated, disposables will be placed in a 55-gallon drum with other solid wastes for eventual disposal by MAFB.

6. Thoroughly wash hands and face.

If non-methane hydrocarbons in the Fire Training Area exceed the background (entire site) by a steady 5-10 ppm it may be necessary to upgrade to Level C are found to be hazardous.

Level C (requires training in the use of the respirator and emergency escape mask). Level C protection is used when the required level of respiratory protection is known, or reasonably assumed to be, not greater

than the level of protection afforded by air-purifying respirators, and exposure to the few unprotected areas of the body (i.e., the back of the neck) is unlikely with Level C protective clothing. Level C requires carrying an emergency escape air supply system, at the discretion of the Site Safety Officer.

Level C protection consists of:

- Full face-piece air-purifying respirators
- Emergency escape respirator (carried, if required)
- Chemical protective overalls and long-sleeved jacket, coveralls, or Tyvec coveralls
- Gloves, inner, surgical type
- Gloves, outer, chemical protective
- Boots, chemical protective, steel toe and shank
- Booties, chemical protective (use may depend on nature of site).

If non-methane hydrocarbons exceed 10 ppm above the background (entire site), it may not be necessary to upgrade to Level B.

Level B protection must be used when the highest level of respiratory protection is judged to be needed, but hazardous materials exposure to the few unprotected areas of the body (i.e., the back of the neck) is unlikely with Level B protective clothing.

Level B protection consists of:

- Open-circuit, pressure-demand SCBA
- Chemical protective overalls and long-sleeved jacket, or coveralls
- Gloves, inner, surgical type
- Gloves, outer, chemical protective
- Boots, chemical protective, steel toe and shank
- Booties, chemical protective
- Butyl rubber apron.

13.0 SAMPLE HANDLING AND PACKING

13.1 Split Sample Procedures

All water, sediment and soil samples shall be split along the guidelines of Quality Assurance/Quality Control (QA/QC) protocols and procedures established by HART. One set of samples will be forwarded for analysis through overnight delivery to Princeton Testing Laboratories, Princeton, New Jersey. The other set of samples will be forwarded for analysis through overnight delivery to OEHL.

The following procedures will be used for splitting soil and groundwater samples.

Soil. Only fairly homogenous samples will be chosen providing a minimum of pebble-sized particles. Initially, the sample will be placed in a stainless steel bowl. Prior to placing the sample in the bowl, the bowl would have been washed with a detergent, rinsed with distilled water and washed again with a solvent (methanol). The sample will be mixed with a stainless steel trowel (prepared in a manner similar to the bowl) until the sample is well combined. Then a sample will be split into halves and a portion of each half placed into sample container. The sample then will be remixed, split again and portions placed into the containers. This procedure will be followed until the sample containers are filled.

Groundwater. A properly prepared bailer will be used to obtain a sample. If the sample is to be tested for volatile organic compounds (VOA), the VOA vials will be placed into a properly cleaned beaker whose depth is greater than the height of the vials. Water from the bailer will be care fully poured into the beaker so that the level rises above the height of the opening on the VOA vials. Once the VOA vials are filled, they will be closed by stainless steel tongs and lifted from the beaker. For other parameters one-half of the water in the bailer will be poured into one container and the other half into the other container. Additional bails will be obtained and split in a similar manner until a sufficient volume of sample is obtained.

13.2 Sample Containers

Glass jars for soil samples in borings will be provided by HART. HART will also supply VOA vials for on site OVA analysis. Water and soil samples for chemical analyses will be placed in glass jars or plastic containers supplied by the laboratory subcontracted by HART.

13.3 Sample Handling and Decontamination

The collected sample and its container represent one of the major avenues of personnel and environmental exposure. Precautions will be taken to ensure that all the samples removed from the site are within the sample container and that no residue remains on the outside of the container.

The procedure for collecting soil and sediment samples will be as follows:

- Identify and document sample collection point or points, depth increment of samples collected and sampling devices used (See Section 14.0, Sample Custody and Documentation).

- Complete log book entries, sample tags, field record sheets with sample identification point, date, time and names or initials of all persons handling the sample in the field.

- Clean the outer surface of glass jars containing soil samples with paper towels and clean water.

- Place Sample Tags on sample containers.

- When filling jars, place small plastic bag around outside of sample container and hold in place with rubber band so that sample spilled outside of container will not contact the jar.

- Sealed sample containers will be carried by the sampling team member to the packaging area. The outer plastic bag and rubber band should be removed by the sampler without touching the external surface of the jar any more than necessary. The volume level should then be placed by the sampler on a clean surface to be packaged for shipment.

- The contaminated plastic bags, rubber bands and residual soil from the mixing pan will be bulked in large plastic bags for disposal as garbage.

The procedures for collecting water samples are generally the same as for soil and sediment, except that the water is discharged directly from the bailer to the sample container(s), following filtration if necessary and appropriate preservatives are added to the containers prior to capping.

13.4 Procedures for Packing Samples

Most (if not all) samples collected during this investigation are expected to contain low concentrations (less than 10 ppm) of organic and inorganic chemical compounds and will, therefore, be considered environmental samples. Procedures for packing samples for shipment will be as follows:

- Determine maximum weight allowed per package from your shipper (140 pounds for Federal Express shipment).

- Secure sample bottle lids or plastic caps on brass tubes with stripping tape or evidence tape.

- Mark volume level on bottles with grease pencil.

- Place about three inches of inert cushioning material, such as vermiculite or zonolite in bottom of cooler.

- Labels/Sample Tags. Numbered sample tags should be used on all samples. Cover the labels with clear plastic tape.

- Place containers in cooler in such a way that they do not touch.

- Put VOA vials in Ziploc plastic bags and place them in the center of the cooler.

- Pack bottles, especially VOA vials, in inert cushioning material.

- Fill cooler with inert cushioning material and blue ice if sample refrigeration is required.

- Put paperwork (chain-of-custody and traffic report copies) in plastic bags and tape with masking tape to inside lid of cooler.

- Tape cooler drain shut.

- After acceptance by Federal Express or shipper, wrap cooler completely with strapping tape at two locations. Secure lid by taping. Do not cover any labels.

- Place lab address on top of cooler.

- Put "THIS SIDE UP" labels on all four sides and "FRAGILE" labels on at least two sides.

- Affix numbered custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

14.0 SAMPLE CUSTODY AND DOCUMENTATION

Sample custody and documentation procedures described in this section will be followed throughout all sample collection at MAFB. See Section 7.0 for the Sample Numbering System to be used by HART.

14.1 Sample Identification Documents

All samples will be labeled for identification by the Sample Numbering System described in Section 7.0.

Sample Tags. Samples will be removed from the sample location and transferred to Princeton Testing Laboratory. Split samples will be sent to OEHL. Before removal, however, samples will be separated as necessary into fractions depending on the analysis to be performed. Each portion will be preserved in accordance with prescribed procedures. Each portion will be identified with separate identification tags. Each tag should indicate in the "Remarks" section that it is a split sample. The information recorded on the tag will include:

- Purpose of the sample (analyte)
- Installation name (location)
- Sample number
- Source/location of sample
- Contract Task Number and Title of Project
- Method of collection (split spoon, bailer, etc.)
- Volumes removed before sample taken
- Preservatives used, especially any non-standard types
- Project code (an HART project number)
- Date
- Time (a four-digit number indicating the 24-hour clock time of collection; for example: 1430 for 2:30 pm)
- Type of sample (grab or composite)

- Sampler's name
- Special conditions/remarks (for example, use of filtering)

Custody Seals. When samples are shipped to a laboratory or returned to a HART office, they must be placed in padlocked containers or containers sealed with custody seals. Two seals must be placed on each shipped container (cooler), one at the front and one at the back. Clear tape should be placed over the seals to ensure that seal are not accidentally broken during shipment.

14.2 Chain-of-Custody Records

All samples will be accompanied by a Chain-of-Custody Record, examples of which are shown on Figure 8. When transferring samples, the individuals relinquishing and receiving should sign, date and note the time on the record. This record will be used to document sample custody transfer from the sampler, to another HART team member, to a shipper, to a laboratory or to a HART office.

Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate Chain-of-Custody Record accompanying each shipment. The method of shipment, courier name(s) and other pertinent information should be entered in the "Remarks" section of the Chain-of-Custody Record.

An additional form required for the OEHL is shown in Figure 9. The Environmental Sampling Data Form 2752 will be included along with the Chain-of-Custody Record.

All shipments will be accompanied by the Chain-of-Custody Record identifying its contents. The original record accompanies the shipment and the yellow copy should be given to the HART field team leader.

Shipments will be sent by common carrier and a bill of lading will be used. Air freight shipments will be sent collect. Bills of lading will be retained as part of the permanent documentation.

FRED C. HART ASSOCIATES, INC.
630 FIFTH AVENUE
NEW YORK, N.Y. 10036

CHAIN OF CUSTODY
Abbreviated Form

FORM : ML 12

Date Rec'd: _____

Client Name: _____ Client No: _____

Sampled by: _____ Sample Group ID or site name: _____ ID or Permit No.: _____

Sample Name or Outfall No.	Date Sampled	Field pH	Field Cond.	Temp.	Flow (gpm)	Notes	ML No.

Analysis Requested:

_____ pH, Alkalinity, Conductivity
_____ Acidity (Mineral or Total)
_____ NH_3, NO_3, NO_2, TKN, Org. N
_____ CN, CN-free, F
_____ SO_4
_____ As, Ba, Cd, Cr, Pb, Hg, Se, Ag
_____ Sb, Be, Sr, Ti, Tl, V
_____
_____

_____ Sus. Solids
_____ Dis. Solids
_____ Total Solids
_____ Turbidity
_____ PO_4
_____ Al, Co, Cu, Mo, Ni
_____ Ca, Mg, Na, K
_____
_____

_____ Oil & Grease
_____ Dis. O_2
_____ Coli - Fecal
_____ Coli - Total
_____ BOD_5, COD, TOC
_____ Zinc
_____ Chromium (Hex.)
_____
_____

_____ Iron (Fe)
_____ Manganese (Mn)
_____
_____
_____
_____
_____
_____
_____

Shipment Method & Carrier (if applicable): _____ Date sent: _____

Requested by: _____ Received by: _____ Date/Time: _____

Final Disposition of Sample(s) _____ Date: _____ By (Init.): _____

FIGURE 8

ENVIRONMENTAL SAMPLING DATA

(Use this space for mechanical imprint)

OEHL/SES ONLY

SAMPLING SITE IDENTIFIER (AFR 19-7)

BASE WHERE SAMPLE COLLECTED

SAMPLING SITE DESCRIPTION

DATE COLLECTION BEGAN (YYMMDD)

TIME COLLECTION BEGAN (24 hour clock)

COLLECTION METHOD ☐ GRAB ☐ COMPOSITE _____ HOURS

MAIL REPORTS TO (circle if changed): ORIGINAL, COPY 1, COPY 2

SAMPLE COLLECTED BY (Name, Grade, AFSC)

SIGNATURE

AUTOVON

REASON FOR SUBMISSION: A-ACCIDENT/INCIDENT, C-COMPLAINT, F-FOLLOWUP/CLEANUP, R-ROUTINE/PERIODIC, N-NPDES, O-OTHER (specify)

BASE SAMPLE NUMBER

OEHL NO.

ANALYSES REQUESTED (check appropriate blocks)

GROUP A		GROUP D		GROUP E		GROUP F	
Ammonia	00610	Cyanide, Total	00720	Phenols	32730	Antimony	01097
Chemical Oxygen Demand	00340	Cyanide, Free	00722			Arsenic	01002
Kjeldahl Nitrogen	00625					Barium	01007
Nitrate	00620					Beryllium	01012
Nitrite	00615					Boron	01022
Oil & Grease	00560					Cadmium	01027
Organic Carbon	00680					Calcium	00916
Orthophosphate	00671					Chromium, Total	01034
Phosphorus, Total	00665					Chromium VI	01032
						Copper	01042

		GROUP G	
Hardness	00900	Acidity, Total	70508
Iron	01045	Alkalinity, Total	00410
Lead	01051	Alkalinity, Bicarbonate	00425
Magnesium	00927	Bromide	71870
Manganese	01055	Carbon Dioxide	00405
Mercury	71900	Chloride	00940
Nickel	01067	Color	00080
Potassium	00937	Fluoride	00951
Selenium	01147	Iodide	71865
Silver	01077	Odor	00086
Sodium	00929	Residue, Total	00500
Thallium	01059	Residue, Filterable (TDS)	70300
Zinc	01092	Residue, Nonfilterable	00530

		GROUP H	
Residue, Settleable	50086	BHC Isomers	39340
Residue, Volatile	00505	Chlordane	39350
Silica	00955	DDT Isomers	39370
Specific Conductance	00095	Dieldrin	39380
Sulfate	00945	Endrin	39390
Sulfite	00740	Heptachlor	39410
Surfactants -MBAS	38260	Heptachlor Epoxide	39420
Turbidity	00076	Lindane	39782
		Methoxychlor	39480
		Toxaphene	39400
		2,4-D	39730
		2,4,5-TP-Silvex	39760
		2,4,5-T	39740
		GROUP J	
		Sulfides	00745

GROUP T	
Bromoform	32104
Bromodichloromethane	32101
Carbon Tetrachloride	32102
Chloroform	32106
Chloromethane	34418
Dibromochloromethane	32105
Methylene Chloride	34423
Tetrachloroethylene	34475
1,1,1-Trichloroethane	34506
Trichloroethylene	39180
Trihalomethanes	82080
PCBs	39516

ON SITE ANALYSES		
Parameter		Value
Flow	50050	mgd
Chlorine, Total	50060	mg/l
Dissolved Oxygen	00300	mg/l
pH	00400	units
Temperature	00010	°C

COMMENTS

AF FORM JAN 81 2752

FIGURE 9

14.3 Field Log Books

Bound Field Log Books will be maintained by the HART field team leader and other team members to provide a daily record of significant events, observations and measurement during the field investigation. All entries must be signed and dated.

All information, except drill logs, pertinent to the field survey and/or sampling will be recorded in the log books. These must be bound books, preferably with consecutively numbered pages that are at least 4 1/2 inches by 7 inches in size. Waterproof ink will be used in making all entries. Entries in the log book must include at least the following

- Name and title of author, date and time of entry and physical/environmental conditions during field activity.
- Purpose of sampling activity
- Location of sampling activity
- Name and address of field contact
- Name and title of field crew
- Name and title of any site visitors
- Type of sampled media (e.g., soil, sediment, groundwater, etc.)
- Sample collection method
- Number and volume of sample(s) taken
- Description of sampling point(s)
- Date and time of collection
- Sample identification number(s)
- Sample distribution (e.g., laboratory)
- References for all maps and photographs of the sampling site(s)
- Field observations
- Any field measurements made, such as pH, water level, etc. All sample documentation such as:
  - Bottle lot numbers
  - Custody seal numbers
  - Dates and method of sample shipments
  - Chain of Custody Records

- All documentation for drums or other containers generated
  - Contents and approximate volume
  - Type and predicted level of contamination
  - Custody seal numbers
- Summary of daily tasks (including costs) and documentation on any cost or scope of work changes required by field conditions.

14.4 Corrections to Documentation

Unless prohibited by weather conditions, all original data recorded in Field Log Books, Sample Tags and Chain-of-Custody Records will be written with waterproof ink. None of these accountable serialized documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one individual, that individual should make all corrections simply by crossing a line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All subsequent corrections must be initialed and dated.

14.5 Shipping of Samples

Samples will be delivered to the EPA-designated laboratory, Princeton Testing Laboratory or to a HART office for analysis as soon as practical after the number of samples and number of coolers is sufficient to comprise a shipment, preferably the same day the sample was taken. The sample will be accompanied by the Chain-of-Custody Record.

15.0 SITE CLEAN-UP

Following the completion of the on-site remedial investigation at MAFB, all sampling sites will be restored within reason to their preactivity condition. All well and boring are cuttings will be removed and the general area following the completion of each well and boring will be cleaned. New groundwater monitoring wells will be locked. Only those drill cuttings suspected of being hazardous waste (based on discoloration, odor and organic vapor detection instruments) will be properly containerized by HART for eventual disposal by MAFB. The suspected hazardous waste shall be tested by HART for EP Toxicity and Ignitability.

HART will repair asphalt surfaces that are damaged due to various field activities using a quick fix concrete or cold asphalt patch.

All sampling and testing equipment will be decontaminated and removed from the site following completion of work.

16.0 FIELD TEAM ORGANIZATION AND RESPONSIBILITIES

16.1 Organization

The HART project field team will be organized according to the sampling activity. For on-site sampling work, the actual sampling team makeup will be dependent on the type and extent of sampling and will consist of a combination of the following:

- Project Manager
- Site Safety Officer
- Field Team Leader
- Geologist
- Technician
- OVA Operator

Subcontractors will be used to provide crews and equipment for drilling, final well development and surveying. One individual may perform more than one of the functions listed above.

16.2 Responsibilities

Specific responsibilities for field team members are described below:

Project Manager: The HART Project Manager will be present at the beginning of field operations. He will brief the field team on the objectives of the sampling program and general procedures to be followed. In his absence from the site, the Field Team Leader will be his representative.

In the absence of Air Force field personnel, the Project Manager (or Field Team Leader) will direct all inquiries to the Air Force Project officer.

Site Safety Officer: The Site Safety Officer will be responsible for the adherence to all site safety requirements by the team members.

The Safety Officer will assist in conducting site briefing meetings and will perform the final safety check. Additional responsibilities are:

- Updating equipment or procedures based upon new information gathered during the site inspection.
- Upgrading the levels of protection based upon site observations. Enforcing the "buddy system" where appropriate.
- Determining and posting locations and routes to medical facilities, including poison control centers; arranging for emergency transportation to medical facilities.
- Notifying local public emergency officers, i.e., police and fire departments, of the nature of the team's operations and posting their telephone numbers.
- Entering exclusion areas in emergencies when at least one other member of the field team is available to stay behind and notify emergency services; or after he/she has notified emergency services.
- Examining work party members for symptoms of exposure or stress.
- Providing emergency medical care and first aid as necessary on-site. The Safety Officer has the ultimate responsibility to stop any operation that threatens the health or safety or the team or surrounding populace.

Field Team Leader: The Field Team Leader will be responsible for the coordination of all sampling efforts will assure the availability and maintenance of all sampling equipment and materials and provide for shipping and packing materials. He will supervise the completion of all Chain-of-Custody Records, the proper handling and shipping of the samples collected, be responsible for the accurate completion of Field Log Books and represent the Project Manager in his absence.

Geologists: The geologists will be responsible for directing drilling activities and installation of monitoring wells, including soil sampling and initial development.

Technician: The Sample Preparation Technician will assume custody of samples to be shipped. He/she will be responsible for completing all Chain-of-Custody. He/she will dispense sample containers, sample

identification tags, etc., to the team members and retain records for control purposes.

OVA Operator: The OVA Operator will be responsible for performing all in-field OVA analyses of soil samples.

16.3 Training

Field personnel will be adequately trained with regard to hazardous waste site experience.

For site-specific training, field personnel will receive the Field Operations Plan, Site Safety Plan and the Project Work Plan in a timely manner to allow for a sufficient review period. Prior to the initiation of site sampling, a field staff orientation and briefing will be held to acquaint personnel with the site, with the operation of any unfamiliar sampling equipment and to assign field responsibilities.

All sampling activities will be based on and will be in compliance with, the site Level of Protection classification, as described in the Site Safety Plan (Appendix A) and Section 12.0.

17.0 SCHEDULE

HART has scheduled the tasks described in this Field Operations Plan to be completed as shown in Figure 10. While every reasonable effort will be made to meet these task deadlines, unexpected drilling conditions or weather events may require adjustment of this schedule. The specific tasks are described below:

TASK	DESCRIPTION
1	Coordination with USAFOEHL Personnel
2	Site Investigation - Sanitary Landfill
3	Site Investigation - Firefighter Training Area (FTA)
4	Explosive Ordnance Disposal (EOD) Area
5	Groundwater Sampling Program (including Corps of Engineers Well [COE])
6	Surveying of Wells and Sample Locations
7	Water Level Measurements
8	First Draft Report (including Risk Assessment)
9	Second Draft Report
10	Final Report
11	Meeting with USAFOEHL Personnel

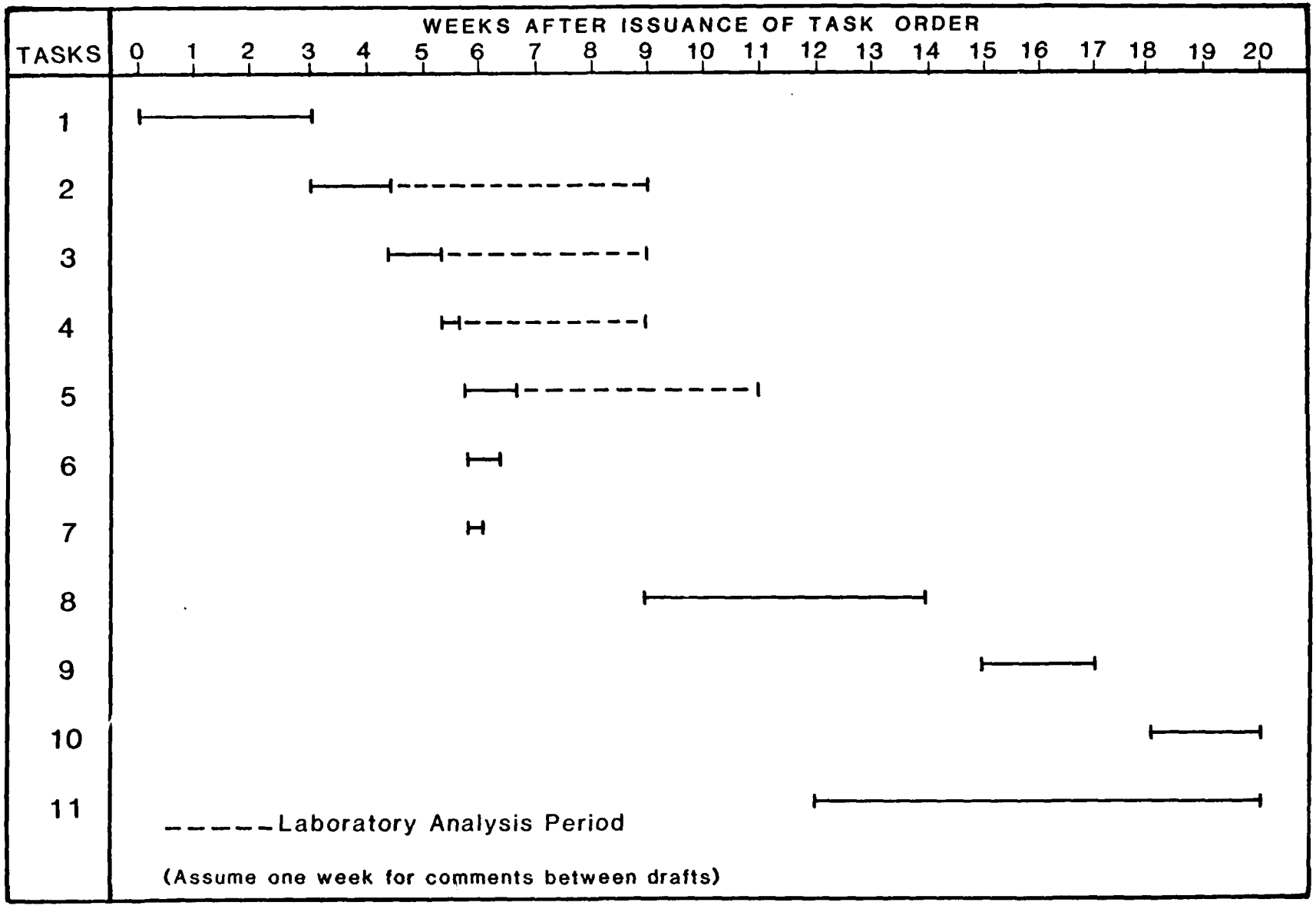


FIGURE 10 PROPOSED SCHEDULE

APPENDIX A

HEALTH AND SAFETY PLAN

PHASE II HEALTH & SAFETY PLAN
MAFB
Minot, ND

Prepared by:

Fred C. Hart Associates, Inc.
530 Fifth Avenue
New York, NY 10036

Project Coordinator

_____

James Mack
Fred C. Hart Associates, Inc.

Site Safety Officer

_____

Vanessa DeVillez
Fred C. Hart Associates, Inc.

1.0 Health and Safety Plan

This Health and Safety Program exists to protect employees from the hazards encountered during field investigations of uncontrolled hazardous waste sites. It is the result of experience gained from working on hazardous waste sites and handling hazardous materials, as well as consideration of all applicable government regulations and guidelines, and consultation with health and safety experts.

Personnel engaged in field investigations of hazardous waste storage, treatment and disposal sites and remedial response activities encounter a wide variety of hazards, including potential exposure to toxic chemicals and radiation, fire and explosion hazards, and other physical hazards due to unstable, deteriorating structures. There is a great degree of uncertainty about an abandoned or uncontrolled site at all stages of an investigation, and there may always be a significant risk encountered at these sites.

This Health and Safety Program is intended to comply with Section 111(c) of CERCLA, EPA Orders 1440.1 and 1440.3, the Occupational Health and Safety Act (OSHA) of 1970, 5 U.S.C. 7902(c)(1).

1.1 Safety Considerations For Remedial Investigations

This section describes the administrative policies and procedures applicable to this remedial investigation.

Although the degree and type of hazard encountered by field teams varies greatly depending on the type of site (e.g., abandoned hazardous waste site or active facility) and the detail of field activity (e.g., preliminary site inspection or multimedia sampling), certain administrative policies and procedures must be adhered to. These include use of properly trained personnel, specific criteria for field team organization and size, site characterization to establish hazard level, proper selection, use and maintenance of personal protective equipment and basic safety procedures.

1.2 Field Team Organization

A field team must be organized to efficiently and safely carry out the objectives of the project. These objectives may include such activities as sampling of hazardous wastes, monitoring well installation, site mapping, metal detection or performing geophysical surveys. The team will typically include individuals with many different technical skills, such as chemists, geologists and engineers. In addition to performing its task objectives, the team must provide for its own safety to prevent injury or exposure to hazardous materials. This can be accomplished by assignment of specific roles and responsibilities to members of the field team and by assuring that the proper team size is used to effectively accomplish specific objectives.

There are a number of roles which are required for the safe and competent operation of a field investigation team. The four roles which are necessary at every site where a field team will be working are Project Manager, Field Team Leader, Equipment Specialist and the Work Party. Additional roles such as Command Post Supervisor, Personnel Decontamination Station Operator and an Emergency Response Team are added to the field team when the scope, magnitude or hazard of the investigation justifies the need for them. A team member may take on more than one role, but the roles must be clearly assigned and must cover all those required rather than describe one team organization for all the different types of field investigations. Guidelines are presented here for assignment of responsibilities to team members to assure safety and for establishing the team size.

1.2.1 Project Manager

The Project Manager is responsible for the overall effectiveness of the field investigation. The specific responsibilities of the project manager include preparing and organizing all project work assignments, briefing team personnel on specific duties, obtaining site access permission from the owner or responsible party, ensuring that the health and safety requirements of the field team are complete and approved by the

Health & Safety Director, preparing a Site Safety Plan, completing reports and maintaining the evidentiary file, complying with chain-of-custody procedures and coordinating with government representatives and subcontractors.

1.2.2 Field Team Leader

The Field Team Leader is accountable for the organization, operation and safety of the field team. This role may be filled by the Project Manager. The Field Team Leader is responsible for proper field operations, maintaining a field notebook which records all site activities, completion of the objectives of the site Work Plan, compliance with document control procedures and proper field documentation of operating procedures and determining the level of personal protection necessary to insure the health and safety of the field team. If subcontractors or outside observers are present, the Field Team Leader must enforce health and safety procedures.

1.2.3 Site Safety Officer

The Site Safety Officer has primary responsibility for all safety procedures and operations on-site. This role is usually filled by the Project Manager. The Site Safety Officer is responsible for upgrading, if necessary, the level of personal protection based upon observations and changing circumstances during the field investigation, enforcing the buddy system (personnel working in pairs); posting and briefing the field team of an approved safety plan which outlines locations, routes and telephone numbers of the closest medical facilities and poison control centers; posting other emergency telephone numbers, such as the fire and police department and Health and Safety Director; and verifying that team members have met the health and safety requirements for field assignment. The Site Safety Officer has the authority to halt any operation that threatens the health or safety of the team.

1.2.4 Equipment Specialist

The Equipment Specialist is responsible for obtaining, inspecting and maintaining all equipment in proper operating order. This requires specialized training in maintenance of equipment, such as self-contained breathing apparatus. The Equipment Specialist is responsible for preparing all sampling containers and equipment.

1.2.5 Work Party

The Work Party is ultimately responsible for the safe and successful completion of the work assignment. The members of the Work Party share many active and important functions which are necessary to fulfill the objectives of the investigation. These include setting up the personnel decontamination station, performing site hazard characterization, taking photographs, collecting samples of various media, decontaminating sample containers, packaging and shipping of the samples in accordance with chain-of-custody procedures, and decontaminating the entire Work Party prior to leaving the site.

1.3 Field Investigation Team Size

The size of an investigation team is determined by the hazard level of the investigation, the level of protection employed, the investigation, objectives and the site characteristics and type. The team must be large enough to assure safety, but not so excessively large as to sacrifice economy.

1.3.1 Two-Person Team

A minimum of a two-person team consisting of HART, personnel will be used at the MAFB to collect environmental samples. A two-person team is appropriate for sites where extensive personal decontamination is not required and where the likelihood of emergency rescue is minimal. The two-person team is suitable when up to Level C protection is required. In the event of an emergency, the team member can summon outside assistance.

Team responsibilities for the MAFB study are identified in the enclosed Site Safety Plan.

1.4 Selection, Use and Maintenance of Personal Protective Equipment

Proper selection, use and maintenance of respiratory protective equipment and other personal protective equipment is extremely important in protecting the health and safety of field investigation personnel. An inadequate level of protection may result in unnecessary exposure to toxic chemicals or other hazards. An excessively high level of protection may encumber field personnel unnecessarily and result in decreased efficiency, fatigue and other hazards. Improper use or maintenance of protective equipment also exposes field personnel to unnecessary risks.

The site hazard assessment will be based on a site characterization obtained from previous site investigations. Once the site hazard assessment is completed, the Site Safety Officer will select the level of protection.

1.4.1 Respiratory Protection

The selection of adequate respiratory protection depends primarily on the type of hazardous substances to be encountered. Proper respirator use requires formal training and continued maintenance of the equipment, in accordance with 30 CFR Part 11 and provisions of the National Institute for Occupational Safety and Health. OSHA regulations pertaining to respiratory protection require a training program that encompasses user responsibilities, training for proper use and respirator maintenance. OSHA also requires qualitative fit testing of face-pieces. Facial hair (beards) and wearing contact lenses is prohibited.

1.4.1.1 Air-Purifying Respirator (APR). The APR, which will be available to team members and may be used at the MAFB, if necessary, removes contaminants from the atmosphere to some degree and can be used only in atmospheres containing sufficient oxygen to sustain life (in open

air this is usually not a problem) and when other criteria, discussed below, are met.

Specific concentration limitations exist for specific devices. The chemical-cartridge respirator provides respiratory protection against certain gases and vapors in concentrations not in excess of that labeled on the cartridge. It can only be used in an area where minimal concentrations might occur and where SCBA has been determined unnecessary. Many types of cartridges are available and field personnel should select the appropriate one for the contaminants expected.

Air purifying respirators or cartridge respirators are worn when:

- Any unidentified and potentially hazardous odor is detected.
- Hazardous materials in the air are not greater than 10 times the permissible exposure limit (PEL) and have good warning properties.
- The Project Manager judges that respirators are needed as a precaution against generation of low levels of toxic substances in air due to sampling, handling, decontaminating or other operations.
- The capacity of the cartridge will not be exceeded by extended periods of use on-site. (If used for extended periods, cartridges must be changed.)

Users of air purifying respirators must comply with the following:

- At least 19.5 percent oxygen must be present for respirator use, or unprotected breathing.
- Cartridge respirators do not supply oxygen. They are of no use in oxygen-deficient atmospheres.

- Air purifying respirators provide less protection than SCBAs and supplied air devices.

- Air purifying respirators must be NIOSH-approved.

- Cartridges also must be NIOSH-approved and should be matched to the respirator by the manufacturer.

- Cartridges must not be used past the expiration date.

- Air purifying respirators will provide adequate protection only if they have good face seals. A qualitative fit test is required for each employee using these respirators.

- Upon experiencing any warning property such as difficulty breathing, dizziness or other distress, strong taste or smell, the user must immediately leave the site. The Field Team Leader or Site Safety Officer may require that a user of an air purifying respirator carry an emergency escape air mask.

- Users of air purifying respirators must follow the manufacturer's instructions on the donning and use of the equipment.

- Cartridges must sometimes be replaced as often as each hour of use, or when the user senses or smells the vapor. If the contaminant of interest does not have warning properties, the APR cartridge must not be used.

1.4.2 Protective Clothing

Protective clothing must be worn by all personnel at hazardous waste sites to prevent skin exposure and to minimize spread of contamination. All on-site operations require protective clothing. Protective clothing may include, but is not limited to chemical-resistant pants and jackets or coveralls, disposable coveralls, steel toe and shank boots, protective gloves, hard hats, face shields or chemical safety glasses. Once adequate

protective clothing is chosen, employees must also note that alertness is a significant safety factor. Since protective clothing is cumbersome, it hastens the onset of fatigue and heat exhaustion, it can decrease alertness and it limits stay-time.

The following section describes Level D protective equipment which is appropriate for the MAFB.

1.4.2.1 Level D. Level D is the basic work uniform and is used where significant exposure to hazardous materials is unlikely. Field personnel must not be permitted to work in civilian clothes.

Level D protection consists of:

- Coveralls, cotton
- Boots/shoes, safety, with steel toe and shank
- Safety glasses
- Hard hat with optional faceshield
- Gloves

Air-purifying respirators (previously described) with appropriate cartridges will be readily available at the site and will be used, if required, during excavation, drilling, sampling, decontamination or other operations.

1.5 Basic Safety Practice

Field personnel will observe basic safety practices. The Health and Safety Director will be responsible for informing all field personnel of these practices. They will include, but not be limited to, the following:

- Observe the buddy system (work in pairs)
- Eating, drinking and smoking are prohibited on-site
- Alcohol consumption is prohibited 24 hours prior to and 24 hours after being on a hazardous waste site

- Contact lenses cannot be worn with any respirators
- Practice contamination avoidance by avoiding obvious contaminated objects/areas and by not sitting or kneeling on the ground
- Do not climb over drums or obstacles
- Maintain contact with the Site Safety Officer

1.6 Site Safety Plan

A written Site Safety Plan must be prepared prior to any field operation. The purpose of the form is to provide information about the site being investigated, an evaluation of the hazards present and the plan developed to protect the field personnel and to prepare for emergency action. The plan is prepared by the Project Manager and submitted to the Health and Safety Director for review and approval prior to the operation.

A standard form is used for the Site Safety Plan which has five parts. The first part provides general information, including the name and location of the site and the objective(s) of the investigation. The second part provides information on the site and waste characteristics, including a description of the facility and its history. The third part of the form is a hazard evaluation, which assesses the potential hazards to site inspection personnel, based on available information. The fourth part of the form is the work plan itself. It establishes the work area, the personal protection (level of protection and equipment) to be used, decontamination procedures, site entry procedures, the site entry team members and their responsibilities and work limitations. The last part of the form provides emergency information, including emergency contacts and resources, and emergency routes to hospitals or other facilities.

The Site Safety Plan must contain specific information describing the safety precautions and procedures to be used and justification for them. The hazard evaluation is a key part of the form, since the plan must be developed on the basis of the evaluation of known or potential hazards.

If hazard information (e.g., possibility of explosive or toxic atmospheres) is not available, the safety plan must include a procedure for obtaining the necessary information or for protecting personnel from unknown but potential hazards.

4.6.1 Reporting Incidents Involving Personal Injury or Exposure to Hazardous Materials

All incidents involving personal injury or exposure to potentially hazardous materials during any field activity must be documented and reported immediately to the Health and Safety Director. A standardized incident report is used for this purpose.

It is important to report all exposures and injuries, even though the incident is not considered serious or no adverse health effects or symptoms are apparent at the time. Often exposure to a toxic agent may have delayed or latent effects which may only be detected by specific diagnostic tests. Documenting an exposure may aid in identifying the cause of symptoms or changes in health status indicators (diagnostic blood tests or pulmonary function, for example) at a later time. Likewise, an injury, such as an eye injury caused by dust particles, may result in delayed damage to the eye.

4.6.2 Site-Specific Safety Plan

The Site-Specific Safety Plan for the MAFB is detailed in Attachment 1. The safety plan provides information on site/waste characterizations, hazards, work plan, investigation-derived material disposal plan and emergency/contingency information.

Level D protection will be adequate during all site activities including the sampling and corrective action activities. Investigation activities will be performed in Level D protection with constant Organic Vapor Analyzer (OVA) Model 128 monitoring to warn against the sudden release of volatile organics into the air. A sudden significant increase in volatile organic emissions may require immediate withdrawal of site personnel and

re-evaluation of protection levels. If non-methane hydrocarbons exceed 10 ppm at any location, personnel will don air-purifying respirators with organic vapor and acid gas cartridges. Soil and water samples obtained during the field investigation will be collected with PVC or neoprene gloves.

Field investigations and sampling activities can result in the generation of contaminated materials. Proper presampling planning must include a management plan for the disposal of materials encountered during field investigations in order to minimize the impact to the environment and the risk to public health. The contaminated materials that will be generated include decontamination rinse water and used disposable clothing. Disposable clothing and rinse water will be disposed of on the site.

APPENDIX A

SITE SAFETY PLAN

SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Minot Air Force Base PROJECT NO. 01071-00-86008-00 (G105)

LOCATION: Ward County, North Dakota

PREPARED BY: Rebekah Dunn DATE: 12/3/85

APPROVED BY: Frances Barker DATE: 12/3/85

OBJECTIVE(S): Conduct sampling for remedial investigation to identify extent and magnitude of contaminated soil, sediment and groundwater.

PROPOSED DATE(S) OF INVESTIGATION: Fall 1986

BACKGROUND REVIEW COMPLETE: X PRELIMINARY:

DOCUMENTATION/SUMMARY: OVERALL HAZARD: SERIOUS
MODERATE
LOW X
UNKNOWN

B. SITE/WASTE CHARACTERISTICS

WASTE TYPE(S): LIQUID X SOLID SLUDGE GAS

CHARACTERISTIC(S): CORROSIVE IGNITABLE X RADIOACTIVE
VOLATILE X TOXIC X REACTIVE UNKNOWN OTHER (NAME):

FACILITY DESCRIPTION: Air Force Base. Major industrial operations relate to maintenance of aircraft, missiles, and ground vehicles.

PRINCIPAL DISPOSAL METHOD (type and location):
Fire Fighter Training Area (FTA) - wastes disposed of include: contaminated fuel and lubricant in pits and in surface drainage ditch.

Explosive Ordnance Disposal (EOD) Range - used to burn, explode and bury munitions, starter and impulse cartridges, flares, explosive bolts and explosives.

On-site sanitary landfill - wastes disposed of include: petroleum, oils, lubricants, miscellaneous potentially hazardous wastes, construction rubble and empty pesticide containers and drums.*

UNUSUAL FEATURES
None presently known, to be determined on site

STATUS (active, inactive, unknown): Active

HISTORY (worker or non-worker injury; complaints from public; previous agency action): None

C. HAZARD EVALUATION

The potential for inhalation of organic vapors and dermal exposure to contaminated soils exists during soil disturbance activities including drilling and sampling.

D. SITE SAFETY WORK PLAN

PERIMETER ESTABLISHMENT: MAP/SKETCH ATTACHED Map attached (See Fig. 1)

SITE SECURED? Yes

PERIMETER IDENTIFIED Yes ZONE(S) OF CONTAMINATION IDENTIFIED? Fig. 2 Map attached

PERSONNEL PROTECTION

LEVEL OF PROTECTION: A B C D X Modified

MODIFICATIONS: Work will be Level D, there might be upgrade to Levels C and B is OVA reading and firing in the Firefighter Training Area Borehole (Subtask 3.2). Upgrade from D to C may proceed if non-methane hydrocarbons exceed 5-10 ppm above background (entire site). Upgrade from C to B may proceed if non-methane hydrocarbons exceed a steady 10 ppm above background (entire site).

SURVEILLANCE EQUIPMENT AND MATERIALS: Organic Vapor Analyzer

DECONTAMINATION PROCEDURES: Drilling equipment steam-cleaned, all sampling equipment (split spoons, bowls, spoons, gloves, boots, etc.) subject to detergent wash, tap water rinse, methanol rinse, distilled water rinse.

SPECIAL EQUIPMENT, FACILITIES, OR PROCEDURES: Cuttings will be drummed and tested to determine if they are contaminated before disposal.

SITE ENTRY PROCEDURES: N/A

TEAM MEMBER (Major)	RESPONSIBILITY
Jim Mack	Project Director
Vanessa DeVillez	Field Team Leader/ QA/QC/Site Safety/ Hydrogeologist
Jim Volz	Hydrogeologist

WORK LIMITATIONS (time of day, etc.): Daylight hours

INVESTIGATION-DERIVED MATERIAL DISPOSAL: Clothing and equipment will be placed in plastic trash bags and disposed of, except in case of contamination, when it will be drummed and disposed of off-site.

E. EMERGENCY INFORMATION

LOCAL RESOURCE

AMBULANCE: 852-2222

HOSPITAL EMERGENCY ROOM: 857-4300

POISON CONTROL CENTER: 800-732-2000

POLICE: 852-0111 or 852-1305

FIRE DEPARTMENT: 852-3311 or 838-4770

AIRPORT: 857-4724

EXPLOSIVES UNIT: None

USAF CONTACT: Capt. DeMay 727-3398

SITE RESOURCES

WATER SUPPLY: 857-4150
TELEPHONE: 727-3691
RADIO: N/A
OTHER: N/A

EMERGENCY CONTACTS

CORPORATE SAFETY DIRECTOR	Laurence Kaufman, Ph.D.	(202) 296-7902
PROJECT LEADER	Jim Mack	(212) 840-3990
HART OFFICE		(212) 840-3990

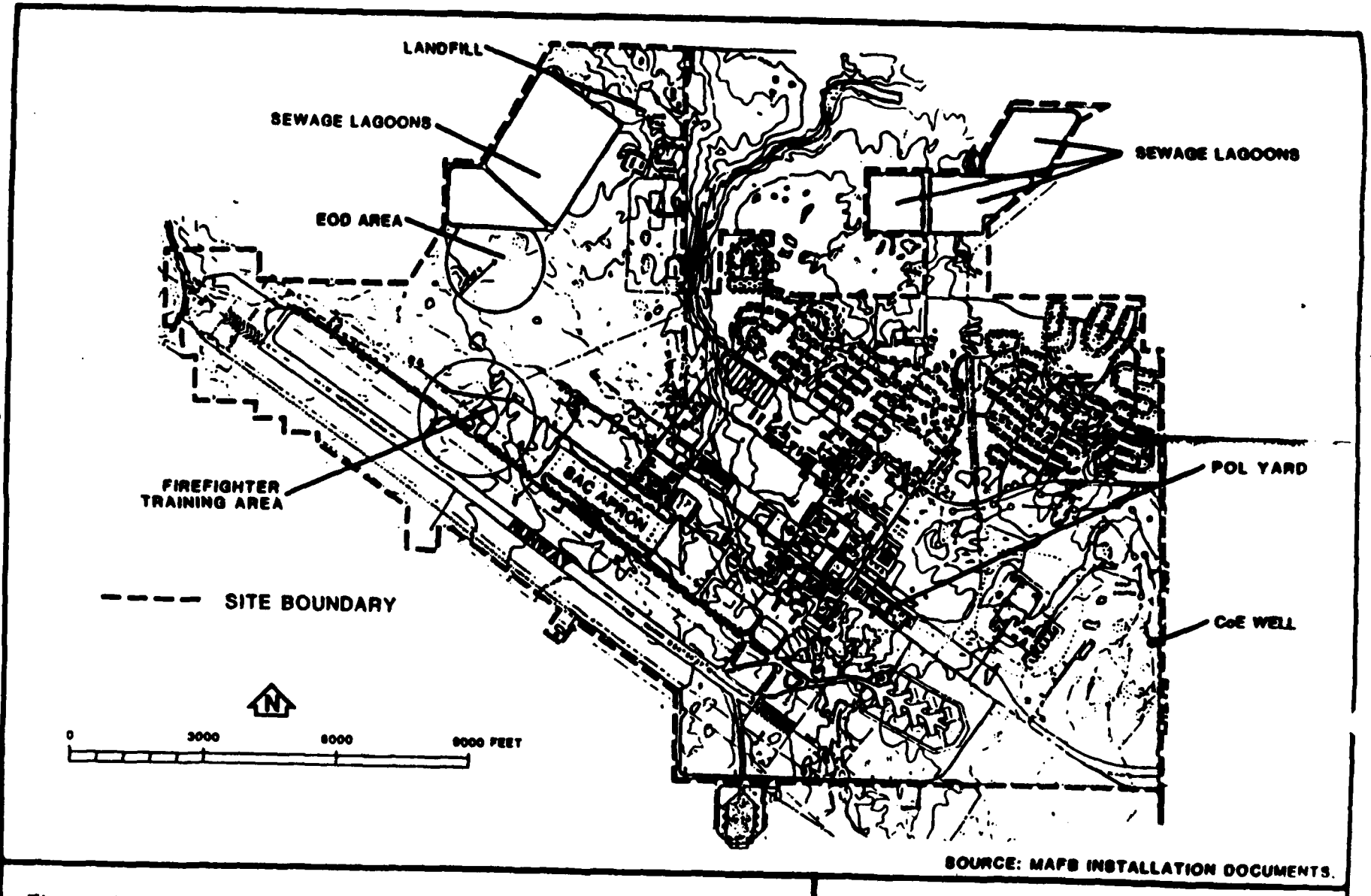
F. EMERGENCY ROUTES

(give road or other directions; attach map; Figure 3)

HOSPITAL: John Moses Memorial USAF Regional Hospital
1500 9th Avenue NW

Take U.S. 83 South - Waste on 9th Avenue to Hospital

OTHER:



SOURCE: MAFB INSTALLATION DOCUMENTS.

Figure 2.1-2
GENERAL BASE PLAN

INSTALLATION RESTORATION PROGRAM
Minot Air Force Base

Atch 3

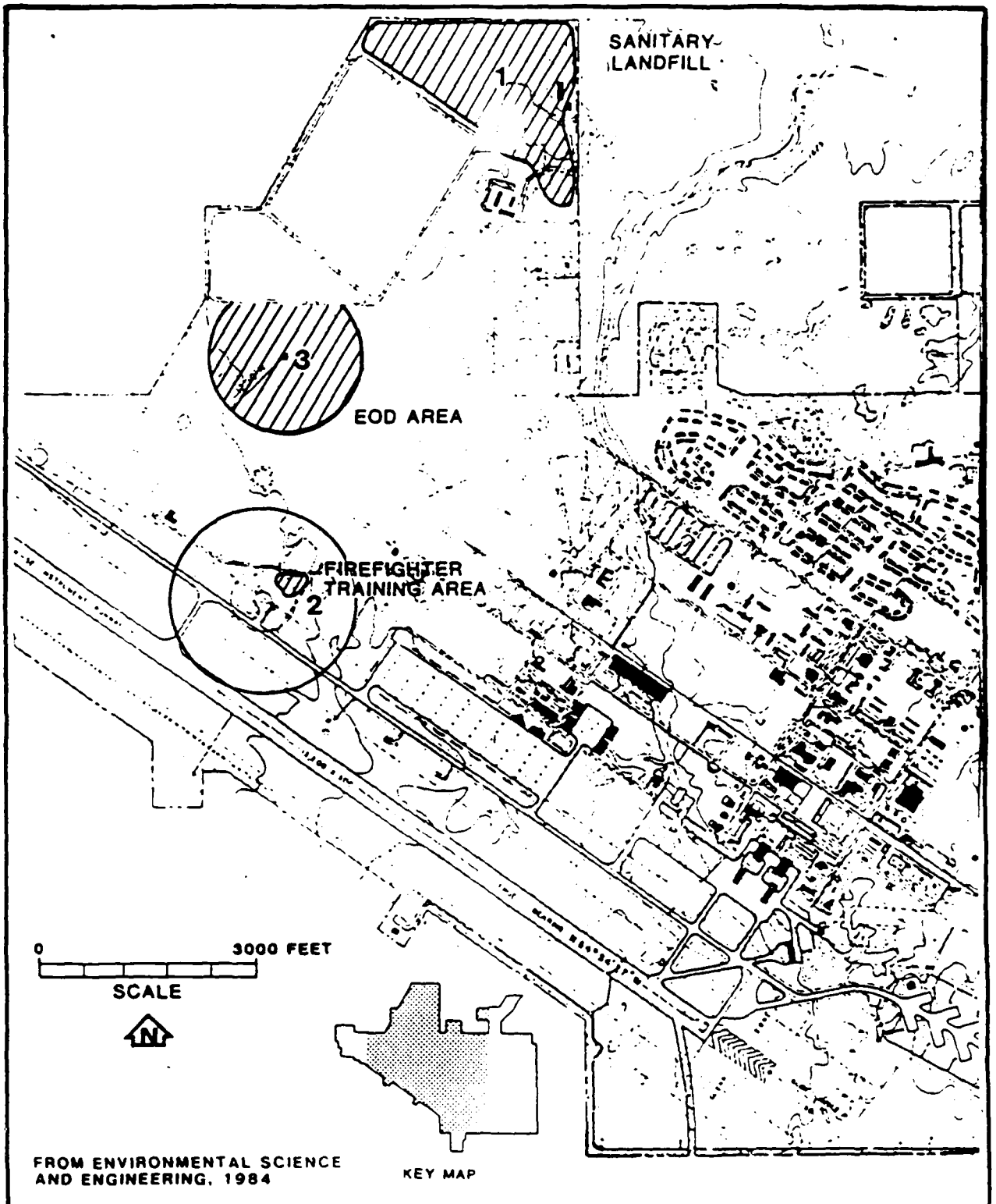


FIGURE 2

AREAS OF POTENTIAL CONTAMINATION

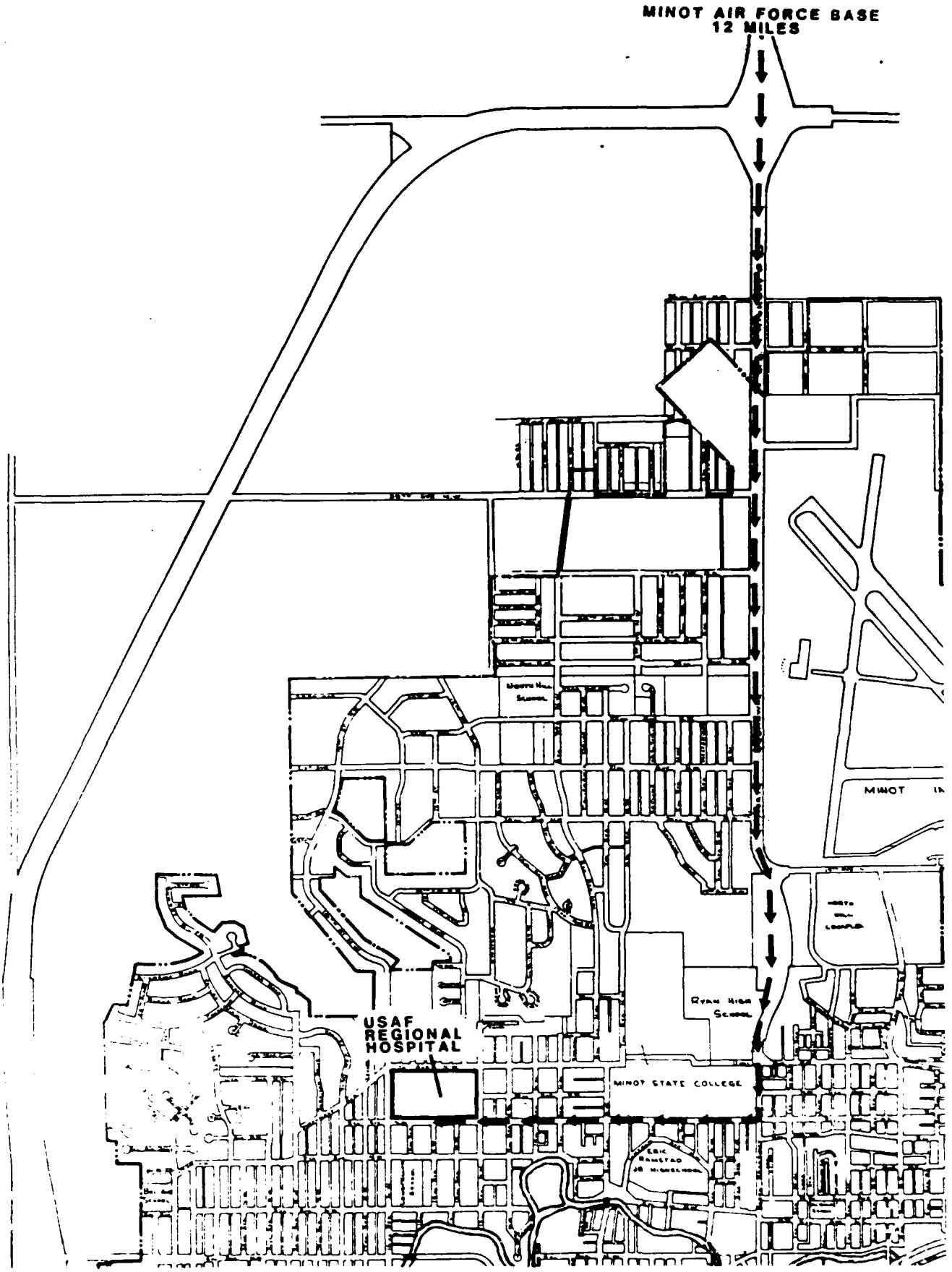


FIGURE 3
N.W. MINOT

APPENDIX B

MINOT AIR FORCE BASE WORK ORDER

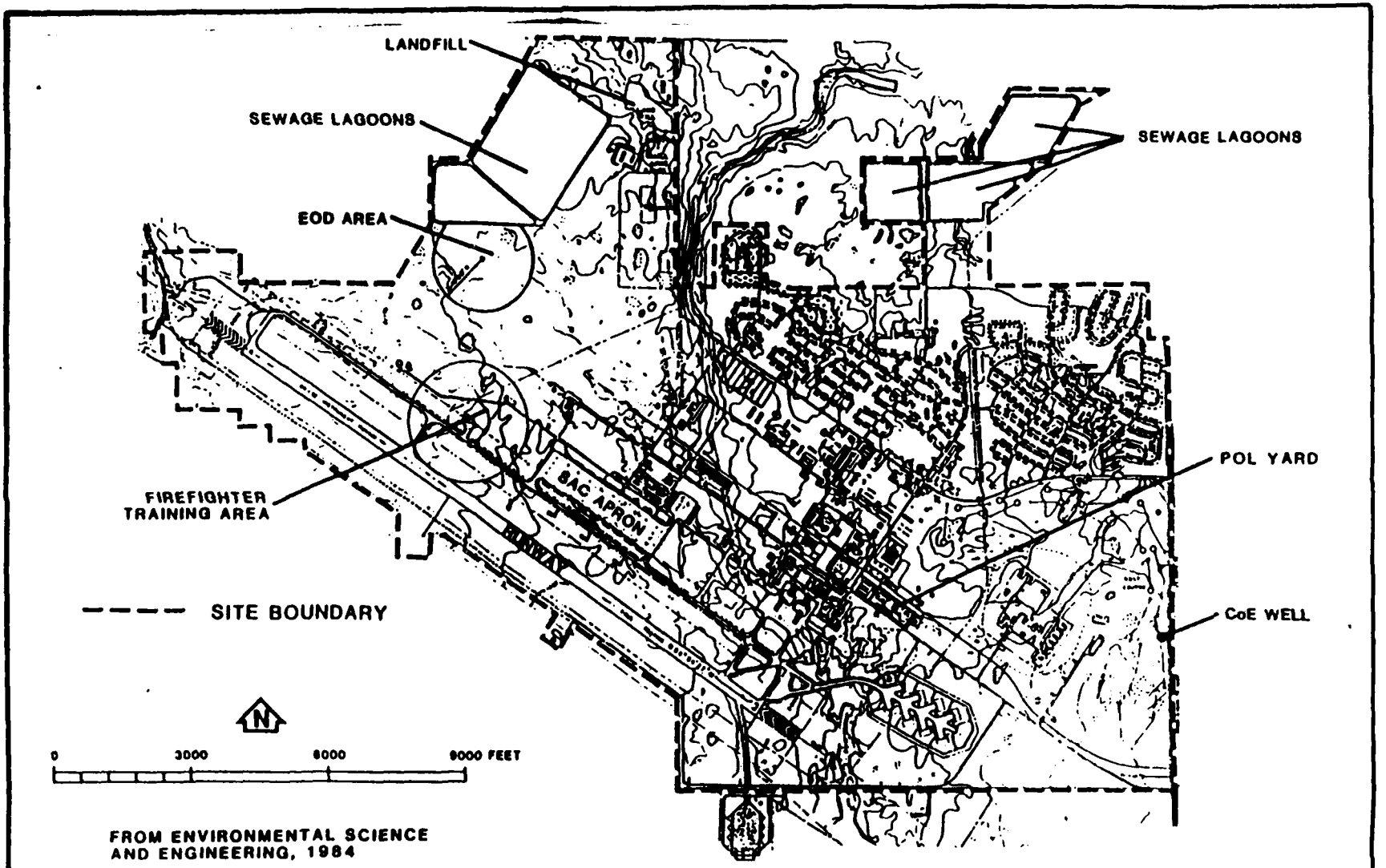


FIGURE 1
GENERAL BASE PLAN

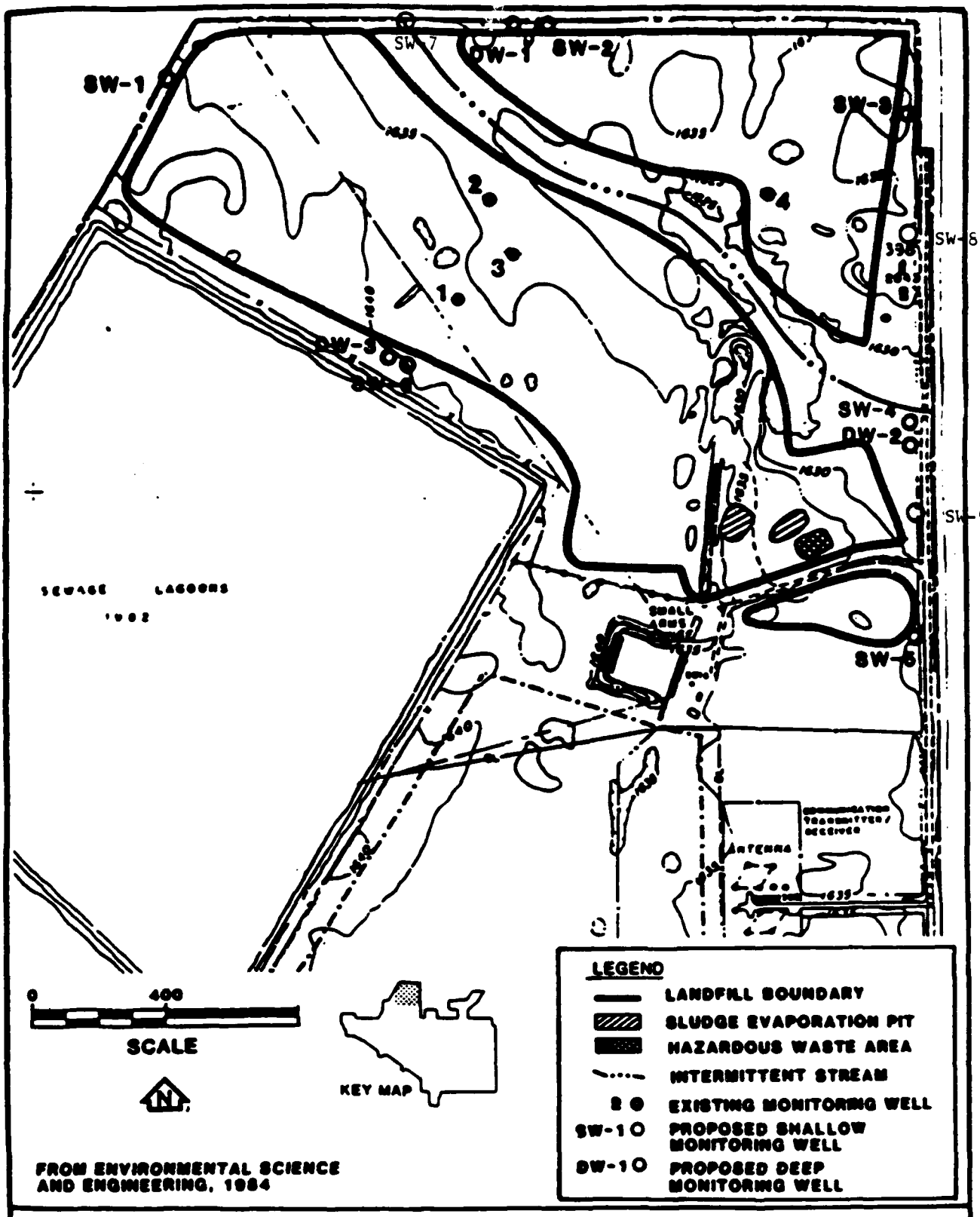


FIGURE 4
SANITARY LANDFILL: LOCATION OF GROUNDWATER MONITORING WELLS

Atch 4

APPENDIX M

TECHNICAL LITERATURE REVIEW

TECHNICAL LITERATURE REVIEW

The literature that deals specifically with the geology and hydrogeology of the Minot area was reviewed to provide a comprehensive understanding of past and current developments in this area. The literature review also served to provide a framework within which HART could conduct further research to more accurately define the geology and hydrogeology of the MAFB area.

Over the past 25 years the geology and ground water resources of North Dakota have been studied on a county-by-county basis in a series of cooperative projects between the North Dakota Geological Surveys, the North Dakota State Water Commission, the U.S. Geological Survey and the various Water Resources Districts. Wayne A. Pettyjohn and R.D. Hutchinson of the North Dakota Geological Survey produced the report entitled "Ground Water Resources of Renville and Ward Counties" in conjunction with the state-wide cooperative effort. This report consisted of three parts: Part I - the geology of the counties; Part II - the basic data report; and Part III - describes the location, the extent, the chemical quality, the quantity of water, the relationship between surface and ground water, the use of the water, the yield of aquifers and the suitability of the ground water for irrigation, municipal, industrial, domestic and stock supplies. This report represents the only comprehensive study of the ground water resources of Renville or Ward counties completed to date. MAFB is located in northeast Ward County approximately seven miles southeast of Renville County.

Alan E. Kehew produced a report entitled "Geology and Geotechnical Conditions of the Minot Area, North Dakota." Included in this report is a map of the surficial deposits of the Minot area which includes MAFB. However, the usefulness of this map is limited because the Phase II investigation emphasized the conditions that exist in the subsurface. Kehew also includes a short discussion of the occurrence of ground water within bedrock and glacial sediments. The emphasis of Kehew's report,

however, is on characterizing the geotechnical conditions, the engineering properties, the foundation conditions, the conditions pertaining to waste disposal and construction materials. For the exception of the conditions pertaining to waste disposal, these aspects are not applicable to our investigation. Kehew's discussion of conditions pertaining to waste disposal is applicable to our investigation; however, this discussion is very limited and was difficult to apply directly to our investigation.

Environmental Science and Engineering, Inc. (ESE) of Denver, Colorado was contracted by the Air Force to perform a site assessment of Minot Air Force Base as the initial phase of the Installation Restoration Program. ESE produced a report detailing their site assessment entitled "Installation Restoration Program Phase I: Records Search, MAFB. This report provided HART with a large portion of the background information required to perform our Phase II investigation.

The following reports were also included in the technical literature review:

- Ground Water Resources of the Surry Area, Ward County, North Dakota; North Dakota Ground Water Study Number 87; by Allen E. Comeskey and Jon Reiten.
- Geology and Occurrence of Ground Water Near Bowbells, Burke and Ward Counties, North Dakota; North Dakota Ground Water Study Number 42; by H.M. Jensen.
- Ground Water in the Vicinity of Ryder and Ward Counties, North Dakota; North Dakota Ground Water Study Number 53; by R.W. Schmid.
- Geohydrology of the Souris River Valley in the Vicinity of Minot, North Dakota; Ground Water Basic Data; North Dakota Ground Water Study Number 65; by Wayne Pettyjohn and D.L. Hills.
- Guide to the Geology of Northwestern North Dakota; by John P. Bluemle.

(CL5061B/0536N)

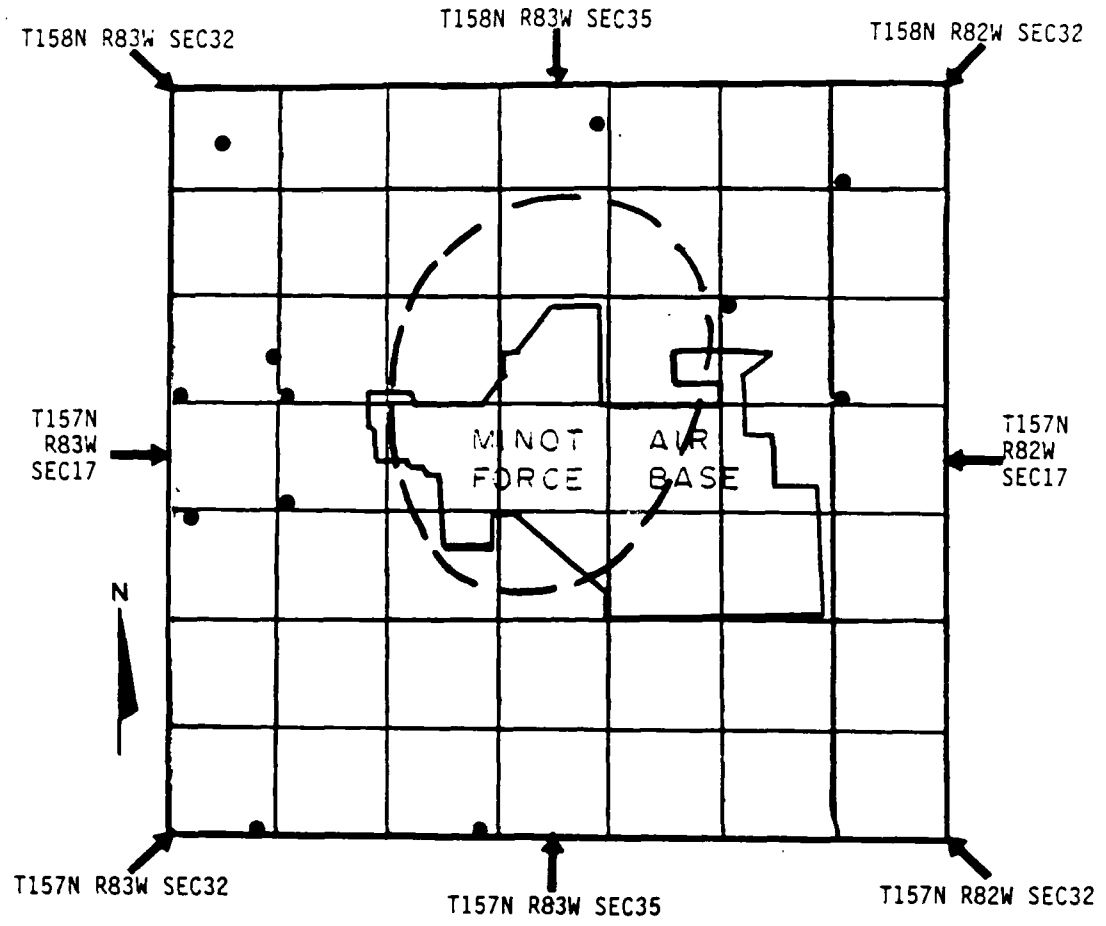
These reports were site specific and, thus, provided very little supporting information to the Phase II IRP investigation at MAFB.

Part II, the basic data report, of the Pettyjohn and Hutchinson report entitled "Ground Water Resources of Renville and Ward Counties" (North Dakota Geological Survey, 1968) included a listing of water wells in Renville and Ward Countries by Township and Range Coordinates. A base map provided in the Pettyjohn and Hutchinson report showed the locations of those wells listed in the report. The portion of this base map which includes MAFB is included in this Appendix as Figure M-1. That area which is within an appropriate one-mile radius of the site investigated at MAFB -- the Sanitary Landfill Area, the Firefighting Training Area and the Explosive Ordnance Disposal Range -- is delineated on Figure M-1. By inspection of Figure M-1, none of those wells identified by Pettyjohn and Hutchinson (1968) are within one mile of the sites investigated at MAFB.

Inspection of the portion of the Burlington Northeast 7.5 Minute Topographic Quadrangle (U.S. Geological Survey, 1949; photorevised 1979) which includes the MAFB property indicates that only one man-made structure exists within one mile of the sites investigated at MAFB. The literature search conducted as an aspect of the MAFB Phase II Stage 1 Investigation did not reveal any information relative to the existence or non-existence of a well at this location.

No wells exist on MAFB property within one mile of the sites investigated at MAFB.

(CL5061B/0536N)



LEGEND

Township and Range Grid System

T158 R83W SEC32

Township and Range Coordinates

Line which delineates the approximate area which falls within one mile of the sites investigated at MAFB.

Location of well identified in the Pettyjohn and Hutchinson (1968) report entitled 'Ground Water Resources of Renville and Ward Counties.'

SCALE:

1 0 1 2

MILES

FIGURE M-1

WELL LOCATIONS IN THE VICINITY OF MAFB SITES

FRED C. HART ASSOCIATES, INC.

M4